PERIODICAL
First Copy

Construction Methods

McGraw-Hill Publishing Company, Inc.

OCTOBER, 1935

Price 20 Cents

SETTING TAINTER GATE at Dam 5-A on Mississippi River near Winona, Wis., being built as PWA project under direction of Corps of Engineers, U. S. Army.

over 50% of the sale of NORTHWESTS is shovels!

Basich Bros. Construction Co., Los Angeles, Calif.	10
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George W. Condon Company, Omaha, Nebr.	4
Dick-Smith Engineering Corporation, Hazleton, Pa.	5
N. A. Degerstrom, Spokane, Wash.	5
Edward H. Ellis, Inc., Westville, N. J.	6
Fredrickson & Watson Constr. Co., Oakland, Calif.	10
General Construction Company, Seattle, Wash.	7
Griffith Company, Los Angeles, Calif.	13
S. J. Groves & Son Company, Minneapolis, Minn.	3
A. Guthrie & Company, Inc., St. Paul, Minn.	4
Hallett Construction Company, Crosby, Minn.	5
Hemstreet & Bell, Marysville, Calif.	7
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Morrison-Knudsen Company, Boise, Idaho.	3
Myers & Goulter, Seattle, Wash.	6
Peninsula Paving Company, San Francisco, Calif.	2
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L. Romano Engineering Corp., Seattle, Wash.	10
J. C. Ruby, San Antonio, Texas	9
A. I. Savin Company, Hartford, Conn.	4
Shirley Construction Company, Omaha, Nebr.	5
Tomlinson-Arkwright Constr. Co., Great Falls, Mont.	5
Trompeter & Sons, Peru, Ill.	4
Utah Construction Company, Ogden, Utah	5
Walsh Construction Company, Davenport, Iowa	2
Charles Weaver, Anoka, Minn.	17
Winston Brothers Co., Minneapolis, Minn.	6
	9

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NORTHWEST ENGINEERING CO.
The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers
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Construction Methods

McGraw-Hill Publishing Company, Inc.,
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor

OCTOBER, 1935

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Warren, in the Buffalo (N. Y.) Evening News

'WAY off Balance

Inventory of Work Relief Funds

● Late last month the President raised to the limit the amount of Emergency Relief Act funds that may be spent for WPA state programs of doubtful value and by so doing made a drastic slash in the sum that might have been applied to PWA projects of useful, permanent types. The relief act, it will be recalled, earmarked $900,000,000 of the $4,000,000,000 work relief appropriation for grants (and loans) to states and cities, but provided that this or any other item in the category might be raised to the extent of 20 per cent of the total appropriation, or by a maximum amount of $800,000,000. The President's recent order, taking full advantage of the permissible 20-per cent shift in fund allocations, now makes available for direct distribution among the states $1,700,000,000,in addition to a $100,000,000 item for housing. The total of $1,800,000,000 includes both WPA and PWA projects, with WPA receiving the lion's share of the spoils, as indicated in the tabulation below.

For PWA projects, at this writing, approved grants from the 1935 Relief Act funds amount to $126,719,259, with indications that Administrator Ickes will receive Presidential sanction for an additional $200,000,000, or a total of $326,719,259, supplemented by $100,000,000 for PWA's slum clearance and low-cost housing program. To Administrator Hopkins and his WPA projects of the made-work type, on the other hand, goes the real stack of blue chips in the amount of $1,373,280,741, representing the difference between the enlarged item of $1,800,000,000 and the PWA total.

Allowing the maximum for PWA and WPA grants, allotments from the $4,000,000,000 work relief fund up to Sept. 23 totalled approximately $3,500,000,000, as follows:

WPA projects	$1,373,280,471
PWA projects (general)	326,719,259
PWA projects (housing)	100,000,000
Highways and grade crossings	500,000,000
C. C. C.	397,000,000
Federal projects	575,323,000
Administrative expense	31,958,137
Total	$3,504,281,137

The foregoing federal expenditure may be supplemented by $500,000,000 more or less, by local contributions to WPA's state programs and by loans to supplement PWA's 45-per cent grants of the cost of non-federal projects.

In order to use his 20-per cent leeway of $800,000,000 in allocating the funds of the $4,000,000,000 work-relief program, the President made drastic cuts in sums earmarked by the relief act for other purposes. For example, highway construction and grade crossing elimination has been reduced from $800,000,000 to $500,000,000; housing from $450,000,000 to $100,000,000, unless the President still has up his sleeve some form of subsidy independent of PWA's slum clearance and low-rent projects. Similar trimmings are in store for the rural electrification and resettlement items of the relief program. The foregoing rough inventory indicates that after providing 9 month's employment to 3,500,000 men from relief rolls there may be a "surplus" of about $500,000,000 on July 1, 1936.

In noting the $1,373,280,741 sum now made available for WPA's leaf-raking, boondoggling and other dubious uses, construction men will reread with a sense of complete disillusionment the Relief Act's avowed purpose "to increase employment by providing for *useful* projects" and its specific declaration in Section 8 of the act that "wherever practicable . . . full advantage shall be taken of the facilities of private enterprise."

Safety Record on Golden Gate Bridge

● A new and bright chapter in accident prevention on construction work is being written in the building of San Francisco's Golden Gate bridge. To date, according to E. N. Goldstine, safety engineer of the California State Compensation Insurance Fund in an address before the Construction Section of the National Safety Council, not a single life has been claimed by this mammoth undertaking. Some of the special precautions taken on this job should be of interest to construction men elsewhere responsible for the prevention of accidents: Workers on the 746-ft. steel towers to support the 4,200-ft. cable suspension span were required to wear protective helmets on the job at all times. They are not permitted to use smoking or chewing tobacco, for there lurked the danger of conveying to the mouth the red lead with which the steel was coated, inviting lead poisoning. Wash-up facilities were provided for the men on the various tower levels, and they were required to avail themselves of them before quitting work and at meal time. Riveters were provided with gas masks and were required to wear them while at work as protection against lead fumes. Extraordinary precautions were taken for the safety of the divers employed in the construction of the coffer-dams for the piers. As a result there have been no deaths from the dread 'bends', a menace to all submarine workers.

Old Fashioned Road Show

● When Joe Louis and Max Baer staged their heavyweight battle in New York last month the fact that the country's fight fans contributed a million-dollar "gate"— the first of its size since Jack Dempsey reigned as world's champion—was interpreted generally by the press as more reliable evidence of returning prosperity than price indices, business "barometers" and other statistical paraphernalia. In the construction industry a portent equally significant of better things ahead is the announcement by the American Road Builders Association of an "old-fashioned" Road Show, to be held in conjunction with its annual convention in Cleveland Jan. 20-24. Road building, like all types of construction, has passed through a period of lean years. While the association has continued to stage its convention regularly every January the equipment exhibit feature of the meeting, beginning with the Detroit Convention of 1933, dwindled to a mere shadow of its former robust proportions and for the last two years has assumed the form of hotel booths displaying catalogs and other promotional literature. It is good news to learn that at Cleveland next January road-builders will have an opportunity of seeing on the spacious floors of the new Exhibition Hall an all-inclusive array of real, full-sized, heavy equipment rather than a display of printed bulletins and photographs on flat-topped tables.

It is a fact established through the years that periods of depression always serve to stimulate inventive genius. While highway construction has been curtailed during the last few years the designers and manufacturers of road-building equipment and materials have been active in developing new products or improving old ones. Many of them have announced that the forthcoming Road Show will be the occasion for the initial display of brand-new features in equipment for the road builder. The convention and show, therefore, give promise of being an event that no highway engineer or road-building contractor can afford to miss.

Construction *Has a Sales Job*

FROM TIME IMMEMORIAL the construction industry has made little effort to sell its services. The manufacturer of automobiles, women's hose, steel sheets or cosmetics, the merchant and the public utility — yes, even the conservative banker — now try to stimulate the use of their products or service. Some push their own brands; others are content to promote the use of their particular type of product.

But, generally speaking, construction does neither. It waits until someone decides to buy some construction service; then it is willing to submit a price. It is content to meet a demand rather than to stimulate one in line with the practice of other aggressive business.

In these competitive days it is time to ask whether this passive attitude is inherent in the industry or can something be done about it. Must the construction industry always wait until more aggressive industries have absorbed most of the national income before it can have a look-in?

THIS writer is not unaware of the difficulties incident to changing this practice. He knows that the primary functions of planning and design are the affair of architects and engineers whose professional obligations are not consistent with any aggressive stimulation of employment for themselves. Moreover, much construction is for large organizations, either public or private, and does not lend itself so readily to conventional sales methods. Then too, competitive bidding, traditional in construction practice, tends to discourage the individual from the effort of stimulating a job in return for a mere chance to bid on it.

These and other circumstances are sure enough difficulties. But such difficulties are but obstacles to be surmounted; they are neither inherent nor vital.

Cannot the professional men devise means to do collectively what they may be estopped from doing individually? Some of this already has been done. Is it not even possible that the professions, recognizing the realities, may relax judiciously some of their narrower restrictions? Is it not feasible for certain architects, engineers or contractors, singly or in combination, to interest large enterprises in tentative studies or proposals looking toward needed new construction? Cannot manufacturers of modern production equipment be enlisted to cooperate with construction men to show specific industrialists the value of their combined products and services? Would not an aggressive effort to sell the reality and value of construction competence to the buyer of construction services help to free the quality contractor from the burden of competing under the handicap of price-alone bidding? Have not the Bureau of Contract Information, the principle of pre-qualification and other kindred agencies now laid a foundation on which may be erected a new merchandising policy for the industry?

These questions are addressed in good faith to an industry that needs an injection of the aggressive sales spirit that has done so much for other American industries. They deserve the best thought of every department of the industry. Some of them suggest collective action: a soundly financed Construction League could deal with some; the Associated General Contractors should handle others; special-field groups that include all functions, such as the American Road Builders Association and the American Water Works Association can help on still others. Many other organized groups have a place. But others call for the kind of individual action that has been shown by many architects, engineers and contractors during the last few years in connection with FHA activities or wholly on their own resources.

IN ANY CASE, what is needed is a viewpoint. Everyone recognizes the importance of the technical, social, intra-industry and legislative functions of existing group effort. But we need a wider recognition by the industry of the promotion function which may have so profound an influence on the volume of work that may be available for the industry to do.

The American people are far ahead in their material standards of living of where they would have been were it not for the aggressive efforts of many industries to sell their services to every consumer and investor. It is about time that construction did its share of this job, not alone in the interest of its own prosperity but also for the advancement of the general welfare.

Willard Chevalier

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TODAY IT'S 33

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These stalwart, fast movers—thirty-three of them in the squad of Geo. W. Condon Company—are playing a stellar role in the dirt-moving game that thrills onlookers with their amazing accomplishments. As fast as the job schedule demands, more of these proved performers are rushed to the scene of action—in fact, four additional ones have just been ordered into the game by this prominent contractor. Like the agile star who flashes around lumbering opponents, this fast-moving squad has set an unequalled record as a *yardage gainer*. Miss no opportunity to witness Trac-Truk outstanding speed and all around performance on the many fields where they are now in action.

Picturing agile, Trac-Truk coordination which gains quicker handling of dirt

Here is a hard-hitting line of 18 Trac-Truks of Condon's squad of Thirty-three

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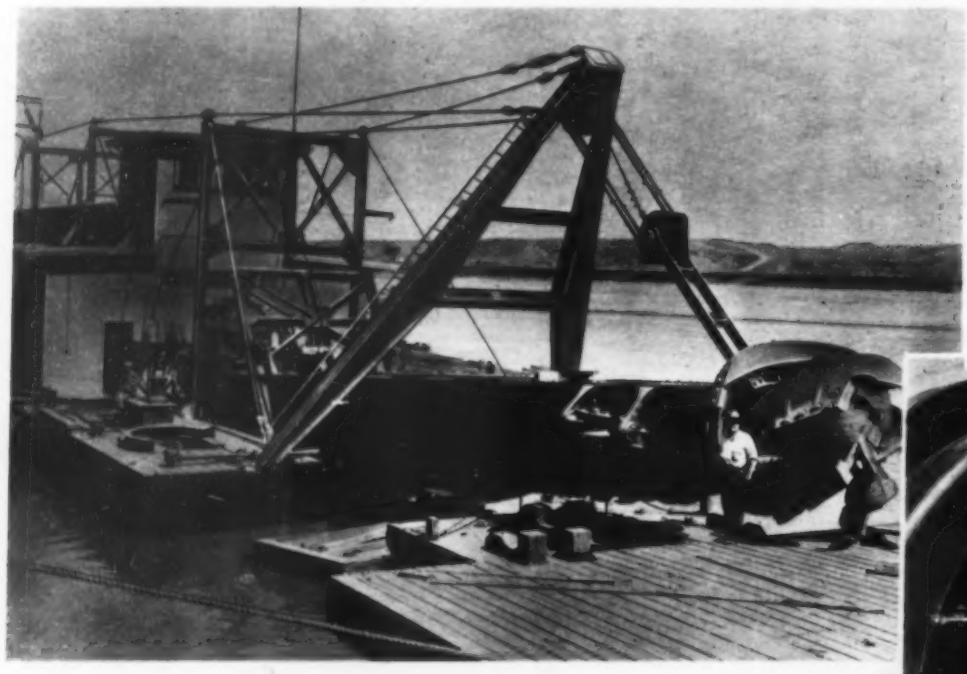
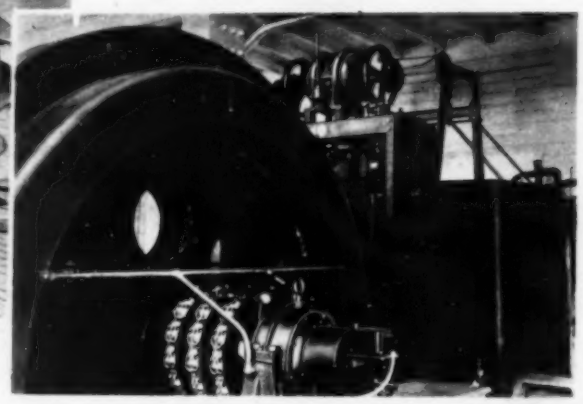


LEFT: Cutter head on Dredge "A" at Fort Peck, equipped with G-E 700-hp cutter motor. Motor is of totally enclosed, externally ventilated, weatherproof design to assure continuous operation in all kinds of weather

BELOW: One of two G-E 2500-hp wound-rotor induction motors installed on pumps of Dredge "A" at Fort Peck. Slip-regulator apparatus in background. All the dredges and boosters used in making the hydraulic fill of nearly 100,000,000 cubic yards are G-E equipped



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This G-E equipment—including four 700-hp cutter-head motors and twenty 2500-hp pump motors for the dredges and boosters—provides two important operating advantages:

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Both of these factors—flexibility to meet every operating condition, dependability that assures continuous operation—mean time and money saved. On *your* jobs, too, G-E apparatus can help speed the work and cut costs. Why not investigate? For complete information, get in touch with the nearest G-E office. General Electric Company, Schenectady, N. Y.

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No need to wait till Spring—you can work straight through the Winter on Summer schedules. Why not figure these advantages on jobs now in progress? You'll find it pays and pays well to use 'Incor'*. Made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other leading cement manufacturers.

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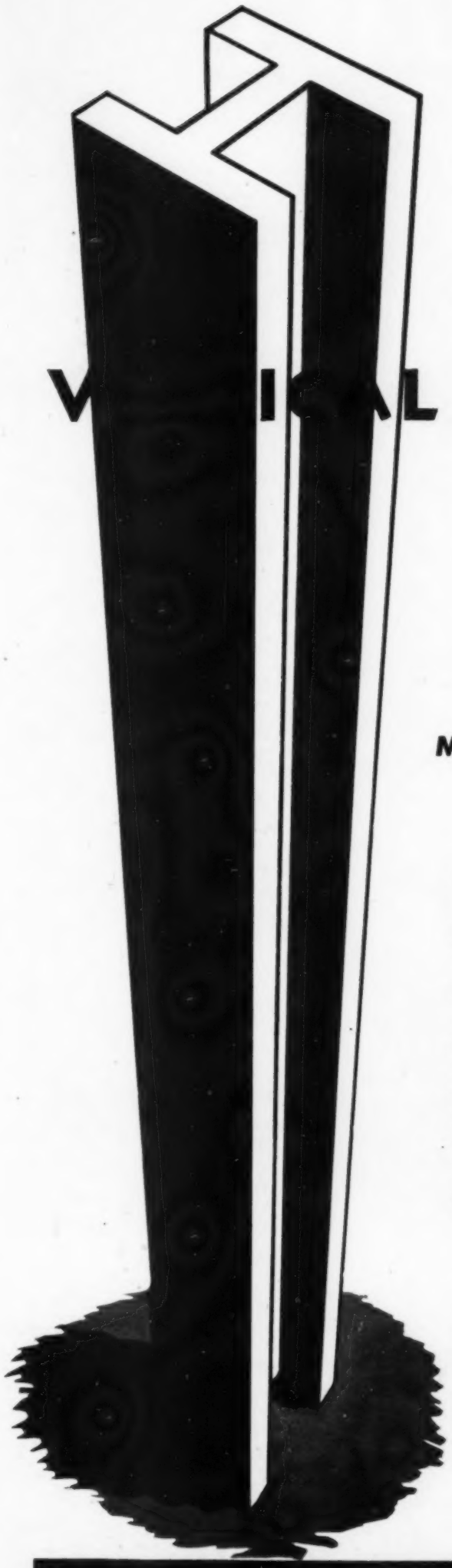

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May be used as combination bearing piles and columns in a wide range of applications. Particularly notable are these:

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3. **Where the scouring effects of stream-borne sand and rock must be guarded against.**
4. **Where heavy loads must be carried on individual piles.**
5. **Where piles must act as free standing columns of great height.**
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In these and in many other situations, the steel bearing pile is serving both bridge and building engineers. More complete information regarding the various sections available and their physical characteristics will be furnished upon request.

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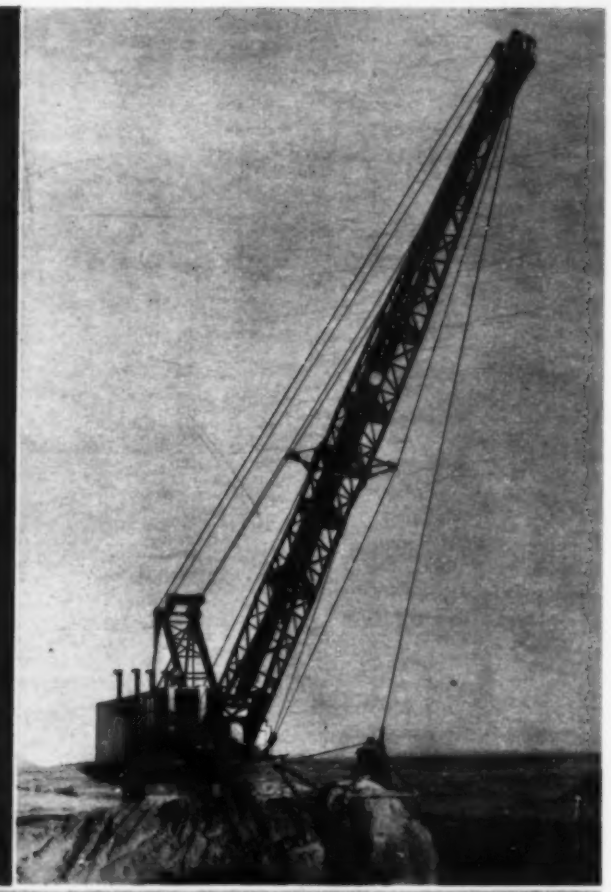

YOU get something new in modern earning-ability in the Bucyrus-Erie 55-B Diesel because this interesting 2½-yard excavator combines new output-ability, convert-ability, move-ability and ship-ability with Bucyrus-Erie's famous depend-ability. Find out about this able machine that means more profits for owners. It's the huskiest, fastest Diesel shovel-dragline-crane in anywhere near its size-class. Send for the 55-B bulletin.

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The "Caterpillar" Diesel Seventy-five Tractor and "Caterpillar" Grader—an unbeatable team for road construction at lowest possible cost. Here it is banking a grade on a highway near Joplin, Mo.

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DON'T LET THIS HAPPEN
Even the slightest misalignment shortens the life of your rope

Know your Ropes

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•

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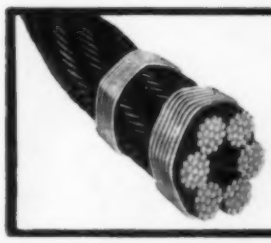
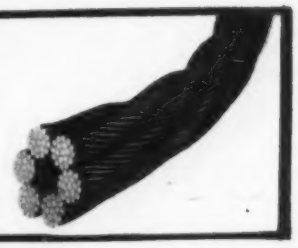


BOTH...STANDARD LAY AND WISSCOLAY PREFORMED.

Wickwire Spencer manufactures all sizes and types of Wire Rope in standard lays and preformed. Wisscolay preformed wire rope will often solve a wire rope application difficulty. Ask our engineers where and when it should be used. Send for a free WIRE ROPE BOOK. It will prove of great value.



Let's Look at Cordeau - - for Wagon Drill Holes

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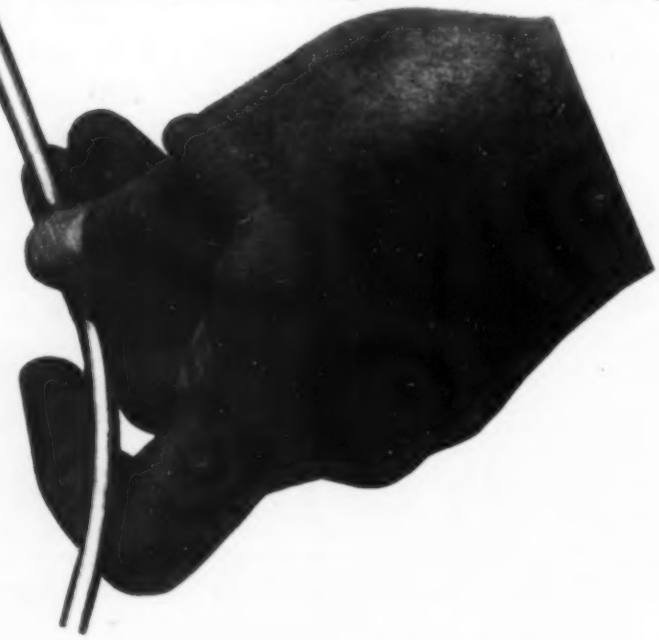
Write for the Cordeau Book

CB—4"



CORDEAU
DETONATING FUSE
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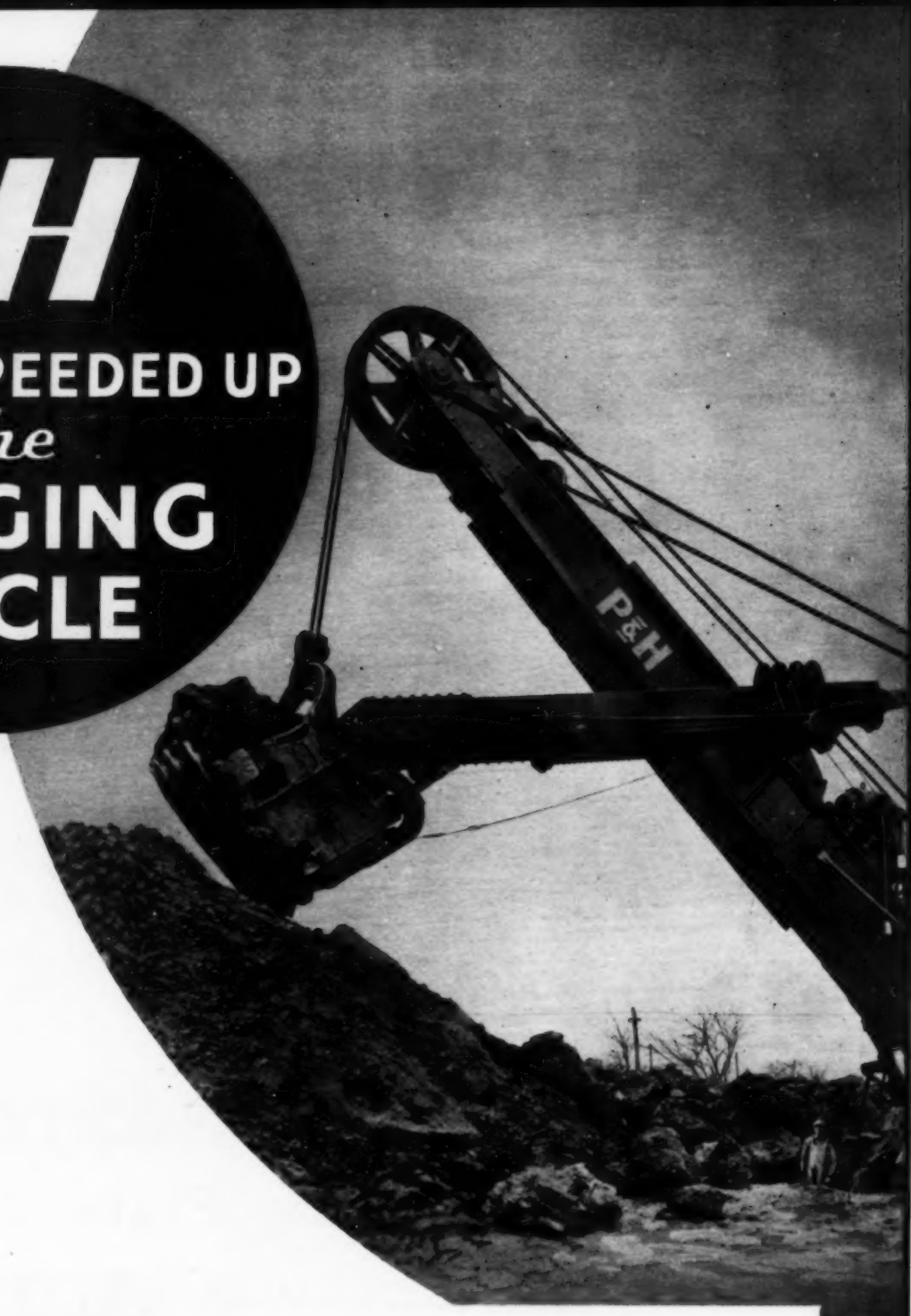
ALSO SAFETY FUSE *Since* 1836

THE ENSIGN-BICKFORD COMPANY

P&H

HAS SPEEDED UP *the* DIGGING CYCLE



More Power, Less Weight Speed Up Action of P & H Electric Excavators

The outstanding feature of the P&H Ward Leonard is the faster operating speeds accomplished through high total horsepower and a more advantageous distribution of weight.

The latter refers to the careful grouping of generators, etc., back of the center of rotation to do away with most of the additional counterweight used in conventional designs. Less counterweight means less dead weight to consume motive power and retard action.

100% Electrical Control

Every move the machine makes is electrically controlled from the operator's cab and simplified to a remarkable degree. Steering, too, is accomplished through the use of hydraulic cylinders electrically controlled from the driver's seat. Travel speed runs as high as 1½ miles per hour—extremely fast for a machine of this size.

Main brakes and clutches are also hydraulically operated, eliminating hand levers, manually operated foot pedals, etc.

Hoist Mechanism

The unusually compact hoist mechanism is a sturdy high speed unit. The large hoist motor is connected to the hoist drum through a set of herringbone gears and a set of massive spur gears. The first reduction mechanism is equipped with anti-friction bearings and operates in an oil bath. The large, heavily loaded hoist drum shaft turns in a long, bronze, sleeve bearing.

The hoist drum, of large diameter, with turned grooves, is easy on cable.

Swing is Faster

On the larger models two swing units are employed. Vertical type motors are used, thereby avoiding the use of spur gears. The helical cut gears are longer lived and operate more quietly—the gears operate in an oil bath. All shafting is mounted in anti-friction bearings. The entire mechanism has been given a large factor of safety to withstand, for a long period of years, the heavy service imposed. Starting from rest the speed of the swing motors increases gradually, thereby reaching maximum speed as quickly as possible—yet smoothly and quietly.

FOR A BIGGER DAY'S WORK

WITH P & H ELECTRIC DRIVE

Abundant horsepower . . . faster swinging . . . balanced machinery units on the main working frame . . . less counterweight...these are some of the reasons why P&H Ward Leonards are big producers. In speeding up the swing as high as 3½ RPM, P&H engineers have licked the real problem of faster digging. Remember that the swing absorbs nearly 67% of the digging cycle.

If you've got a big job in dirt or rock, we will present some facts that will interest you. Better investigate these P&H Ward Leonards. Their modern design does things to handling costs.

HARNISCHFEGER CORPORATION

4494 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

Warehouses and Service Stations:

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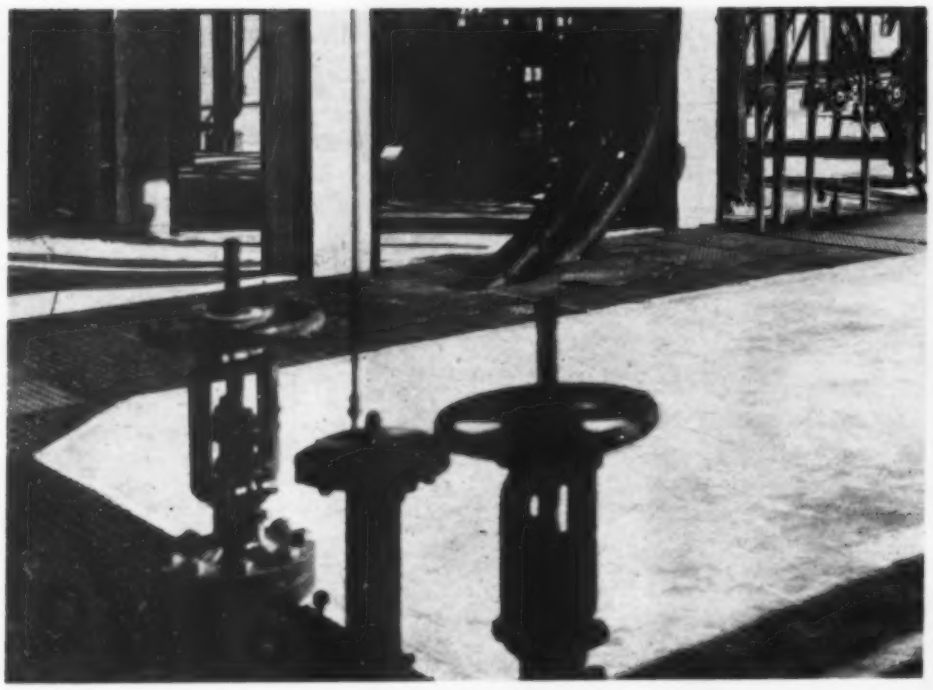
P&H

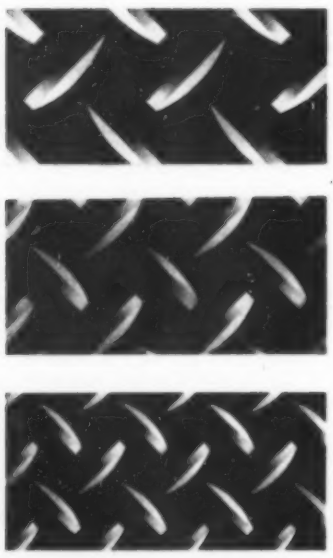
WARD LEONARD

ELECTRIC EXCAVATORS



All danger spots, indoors and out, are covered with Inland 4-Way Floor Plate in this foreign plant of a leading American oil company. At right, above: Many railroad car vestibules and steps are now of Inland 4-Way Floor Plate. Below: Loads do not slip off—platform of Inland 4-Way Plate.

Since 1931... Many Have Met the OBLIGATION with Inland 4-Way Floor Plate (Patented)



Relative size of projections on Large, Small and Light Patterns of Inland 4-Way Floor Plate. Projections are respectively 1¼", 1", and ¾" long.

In 1931, Inland offered to Industry a better method of meeting the obligation of safety to employees and the public—Inland 4-Way Floor Plate. 4 superiorities caused its immediate and widespread adoption by leading companies for use wherever foot or wheel may slip.

Projections exactly center one another at right angles on Inland 4-Way Floor Plate. Resistance to slippage is equal no matter at what angle foot or wheel contacts the plate. 4-Way Safety.

Projections overlap, reenforce one another both lengthwise and crosswise. Extra Stiffness 4-Ways results—an important factor on such applications as walkways.

4-Way can be cut to match whether plates lie side to end, end to end, or side to side—a worthwhile economy, for even small pieces can be used. And 4-Way Plate drains and sweeps clean 4-ways.

Made in three patterns to meet all requirements. Write for new folder illustrating how others have met safety problems similar to yours. INLAND STEEL COMPANY, 38 S. Dearborn St., Chicago, Ill.

4-Way Safety

Extra Stiffness

4-Way Matching

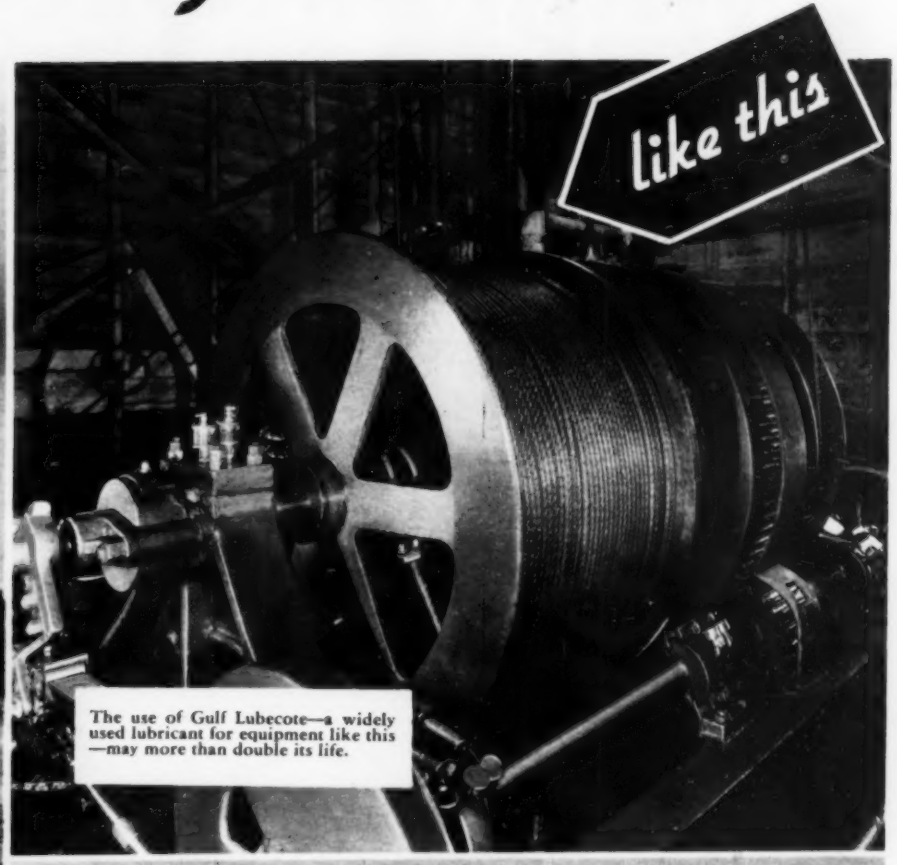
4-Way Drainage

INLAND STEEL

Sheets Strip Tin Plate
Plates Structurals Piling
Rails Track Accessories
Bars Rivets Billets

PROTECT *Costly* EQUIPMENT

For Diesel engines, open gears, cables and all other requirements for shovels and drag lines, Gulf supplies a complete line of quality lubricants.



The use of Gulf Lubecote—a widely used lubricant for equipment like this—may more than double its life.

...WITH THE *Right* GULF LUBRICANTS

From Gulf's Complete Line of Oils and Greases You Can Select the Most Efficient Lubricant for Each Purpose

WHEN contractors make a large investment in modern equipment, its maintenance assumes new importance. Profits depend on the hours—and years—of low cost service such equipment will deliver.

When you use Gulf lubricants, you receive the co-operative services of a trained lubrication engineer whose job is to help you get the maximum of efficient and economical service from your equipment.

This careful attention to lubrication will often double the life of machines and parts which suffer badly from friction and wear when lubricants of the wrong type or quality are used.

Let a Gulf engineer help you protect your capital investment. It will mean real economies and profits to you in the end.

GULF REFINING COMPANY, Pittsburgh, Pa.

District Sales Offices: Boston · New York · Philadelphia · Atlanta
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GULF INDUSTRIAL LUBRICATION

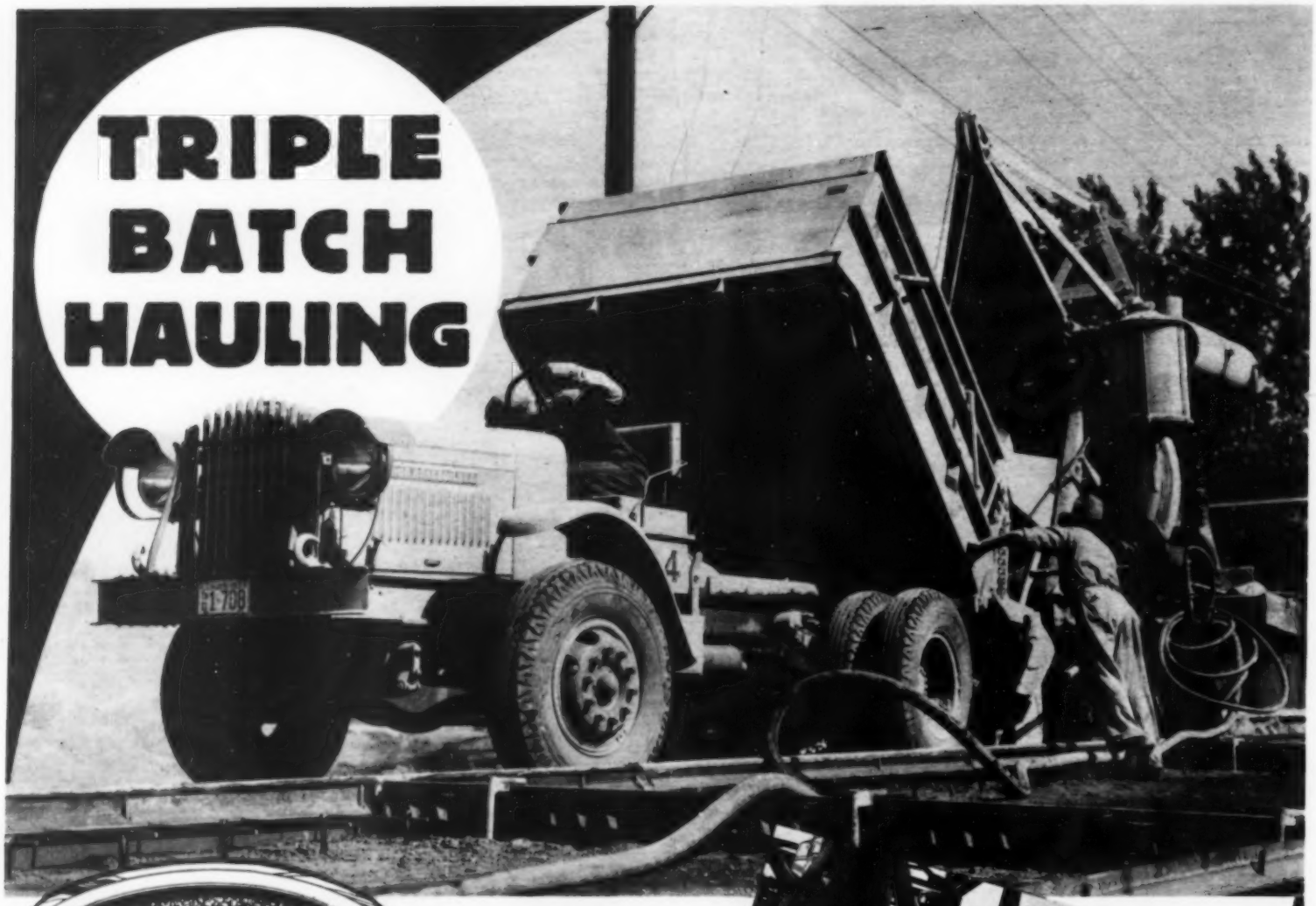
To help contractors analyze and reduce their lubrication and maintenance costs, this brief treatise has been prepared. Your copy is ready.

GULF REFINING COMPANY, CM-10
3800 Gulf Building, Pittsburgh, Pa.

Please send without obligation, booklet "Lubrication Cost Recording."

Name .....
Title .....
Company .....
Address .....

TRIPLE BATCH HAULING



HUG

Part of a fleet of Model 87-K owned by the Madison Construction Company, Edwardsville, Illinois, three batch hauling on new slab near Hartford, Illinois.

The Madison Construction Company has purchased 25 Hug Roadbuilders in the past 10 years.

Triple Batch Hauling with the Hug Roadbuilder Dump Truck is one sure way of cutting costs on a road building or construction job.

Because Hug Roadbuilders are designed and built expressly to fit the job on which they are to be used, they can haul bigger loads—haul them faster—**and** still be hauling loads profitably years after ill-adapted lightweight equipment has outlived its relatively short span of usefulness.

Hug Roadbuilders are designed expressly for those unusual conditions where the going is tougher than expected.

Into every Hug Roadbuilder is built that extra stamina, extra power, extra speed—all with an amazing ease of handling due to the equalized load distribution, short turning radius and the famous Hug Front Axle Rocker Action.

Your Hug dealer can readily show you how and **why** you can eliminate troublesome, costly transportation delays by using Hug Roadbuilders. See him at once, or write us for further details.

THE HUG COMPANY

534 CYPRESS STREET, HIGHLAND, ILL.

BUILT TO MEET A CONDITION

MOVES MORE DIRT *per hour··per dollar of cost*

Digging to Heaped Capacity

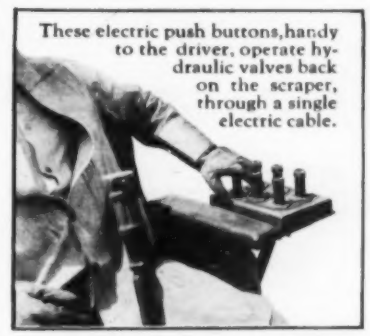
With the front gate partly lowered a ribbon of material enters the pan smoothly and swiftly. Although rated at 12 yards, the 12½ yard load shown here is the rule rather than the exception.

Lifting and Carrying

The loaded pan is lifted hydraulically without demands for power on the tractor. A separate engine on the scraper provides the hydraulic power. When lifted the lowest point of the unit has 11½ inch road clearance.

Dumping and Spreading

Following up on that part of the load which dumps by gravity, a powerful push-out door clears the pan completely. This operation is also hydraulic and like the lift is actuated by remote magnetic control from the tractor cab. (See below.) Only an electric cable and the draft pin connect the tractor and scraper, but positive remote control is assured.



These electric push buttons, handy to the driver, operate hydraulic valves back on the scraper, through a single electric cable.

● The full 12-yard capacity of the new Austin-Western Hydraulic Scraper suggests that in size alone this unit will dig, load, haul and dump at a high rate per hour. But this is only the most obvious advantage. Actually this scraper will handle one 12-yard load faster than other units can perform the complete cycle of operations for even a smaller load.

Why? Special alloy steels provide light weight without sacrifice of strength. Hydraulically controlled with a separate engine mounted on the scraper, but operated from the tractor by remote magnetic control. Properly designed pan for quick and easy loading and unloading. Hydraulic push-out door completes the dumping operation quickly and easily.

The result is outstanding performance—handling all materials from sand to decomposed rock—cutting to a depth of 6 inches and spreading anything from a thin layer to a depth of 2 feet. Write for full details.

The Austin-Western Road Machinery Co.
A-6, Aurora, Illinois

Please send Austin-Western Hydraulic Scraper Bulletin 1445.

Name 482

Address .....

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ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS

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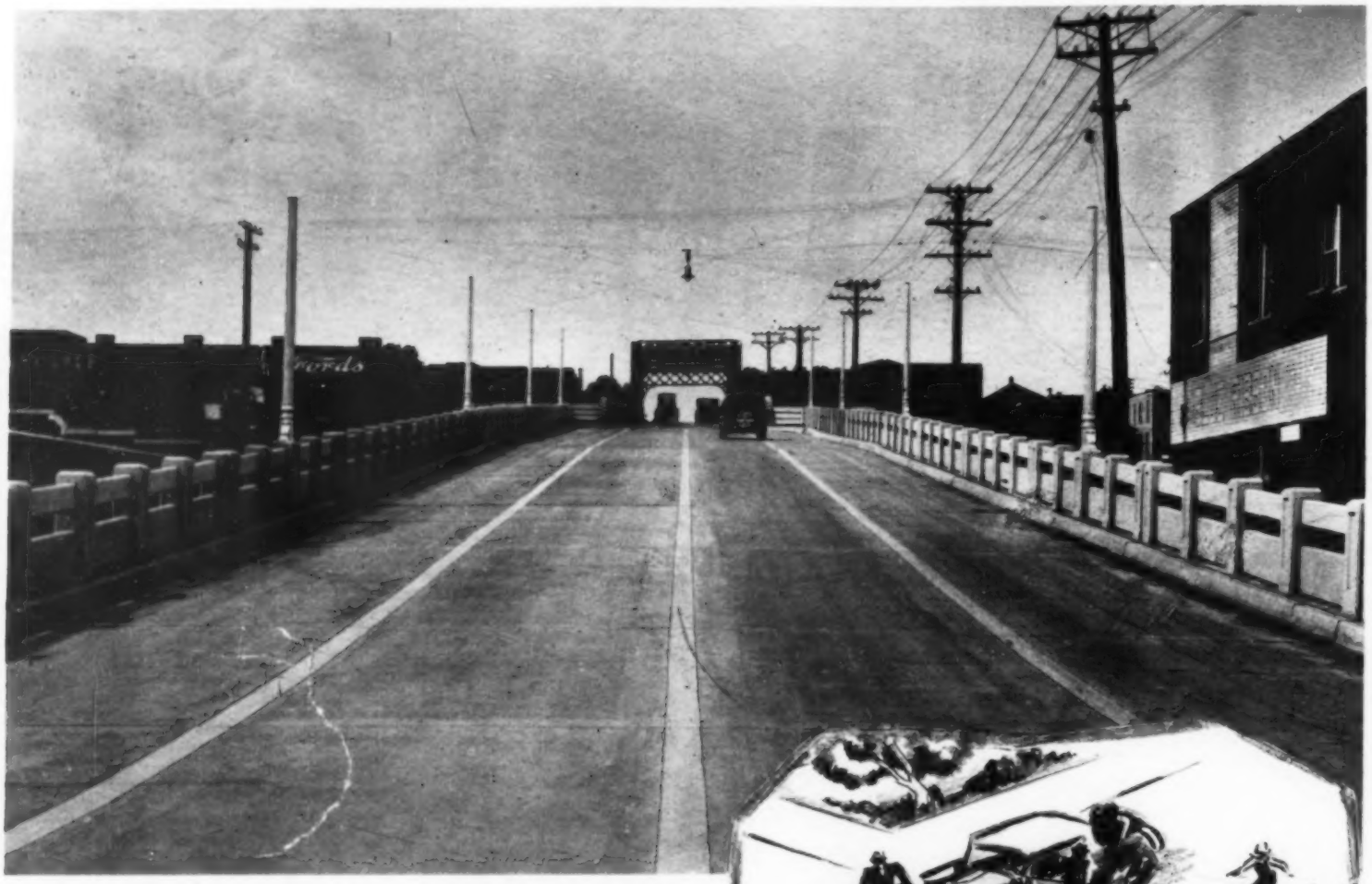
CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

WHITE CONCRETE TRAFFIC MARKERS AID IN DRIVE FOR TRAFFIC SAFETY



To help curb careless driving, permanent white concrete traffic markers were installed on the Walnut Street Bridge, Oklahoma City, by Lee Bush, City Engineer, and E. H. Stratton, Supt. of Construction, with city forces.

Traffic officials in many states and cities find installation of white concrete crossing markers help to cut down accidents like this.

One year's record—

Killed: 36,000
Permanently disabled: 100,000
Injured: 1,150,000

These are not war casualties. They are the grim figures for death and injury from automobile accidents in the United States in 1934. And up to August 1 this year motor cars have killed another 18,000 and have injured 35 times that many men, women and children in this country.

What can be done? Three things, says the National Safety Council: 1. Educate drivers and pedestrians to safety. 2. Keep vehicles in good condition. 3. Improve our streets and highways safety-wise.

In every part of the country, highway and traffic officials, as well as members of the automotive industry, are making a concerted drive to carry out this 3-point safety program—determined to batter down the steadily rising curve of death and injury.

No one means, of course, can be singled out as a cure-all. But in the drive to build greater safety into streets and highways (point 3 in the program) there is one thing which officials have found helpful—permanent white concrete traffic markers.

These white concrete markers, made with *white* portland cement, combine *constant* visibility (and hence greater safety) with economy. They are not surface markers, but are built *into* the pavement—asphalt, brick or concrete. They can't be worn away. They never fade out. They never need replacement. They are *always* white—*always* easy to see. Write for complete information to Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South La Salle Street, Chicago.

189

Help Build Safety into Streets and Highways with

ATLAS WHITE TRAFFIC MARKERS

Made with Atlas White Portland Cement—Plain and Waterproofed

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919—McGraw-Hill Publishing Company, Inc. Volume 17—Number 10—New York, October, 1935

COPPER HOUSE *Makes Its Début*

INTO THE FIELD of residential building construction in the United States the "copper house" has just made its entry. Developed by Copper Houses, Inc., subsidiary of Kennecott Copper Corp., a steel-frame structure of the English farm-house type, with all exterior surfaces sheathed in copper, in addition to copper piping for the plumbing and heating systems has recently been completed at Bethesda, a suburb of Washington, D. C. The outside walls of the 2-story and basement building consist of panels made of 48-oz. copper plates cemented to ½-in. thick Celotex sheets. These panels are fastened to the structural steel framework of the building by special bronze holding strips, designed to provide for both horizontal and vertical expansion of the metal panels, and at the same time to insure a weatherproof and insect-proof connection. Between the copper covered exterior wall panels and the interior wall surfaces of ¾-in. thick plaster on metal lath the design provides for a 4-in. thick insulating fill of spun glass to minimize thermal conductivity.

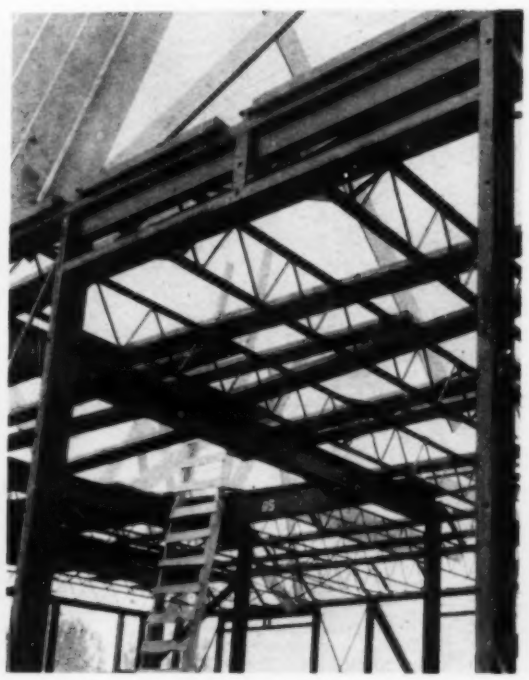
The roof is covered with regular 16-oz. sheet copper laid over a layer of black roofing paper on a wood deck of ⅞-in. matched roofers carried by 2x6-in. rafters. The first and second floors of the structure are carried by Truscon open-truss steel joists supporting Gypsteel planks covered by hardwood flooring. Bearing is entirely on the outside steel framework, the interior walls between rooms carrying no load. The exterior copper surfaces of the house are painted to prevent glare from the metal surfaces.

Among the advantages claimed for the copper house is its resistance to deterioration caused by weather, rust and fire.

Plans for this and similar houses in accepted colonial and other architectural styles, to be erected by Copper Houses, Inc., were prepared by John J. Whalen, architect, of Washington, D. C. Construction was in charge of C. R. Matheny, also of Washington. The cost of the first house of this type was approximately $13,500, exclusive of land, but other designs range from $4,500 upward. The copper house, its sponsors emphasize, is not a prefabricated structure except for the wall panels and elements of the steel framework. Its construction may be handled without difficulty by the regular building trades in the usual way.

SHEATHED IN COPPER. All exterior surfaces of pioneer residential structure near Washington, D. C., are formed of enduring metal in plates (for side walls) and sheets (for roof) painted to eliminate glare.

COPPER PLATES cemented to ½-in. thick wallboard on inside surface are attached to steel framework to form walls of house.



STEEL FRAMEWORK, with 12-in. open-truss joists on 2-ft. 8-in. centers, to carry floors, forms backbone of two-story copper house.

INSULATING LAYER of spun glass 4 in. thick is placed between exterior copper panels and inside wall surface of plaster on metal lath.

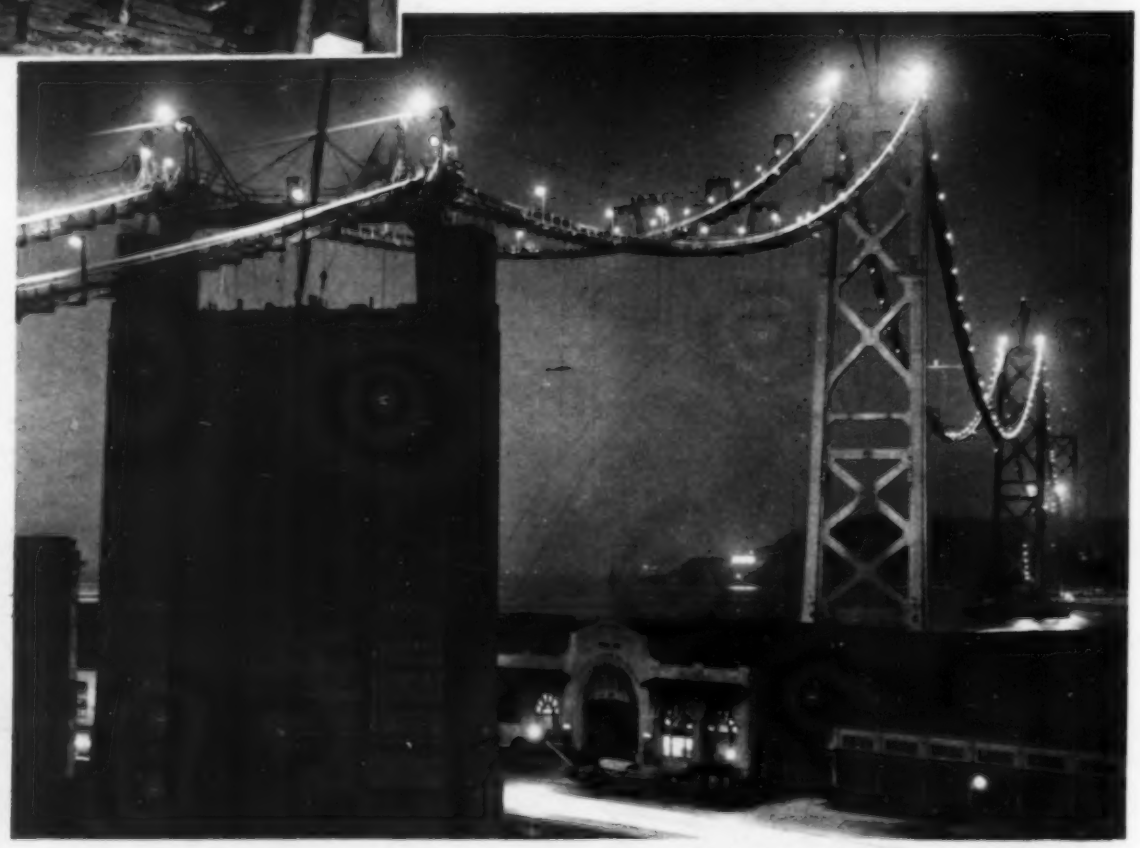
This Month's

"NEWS REEL"

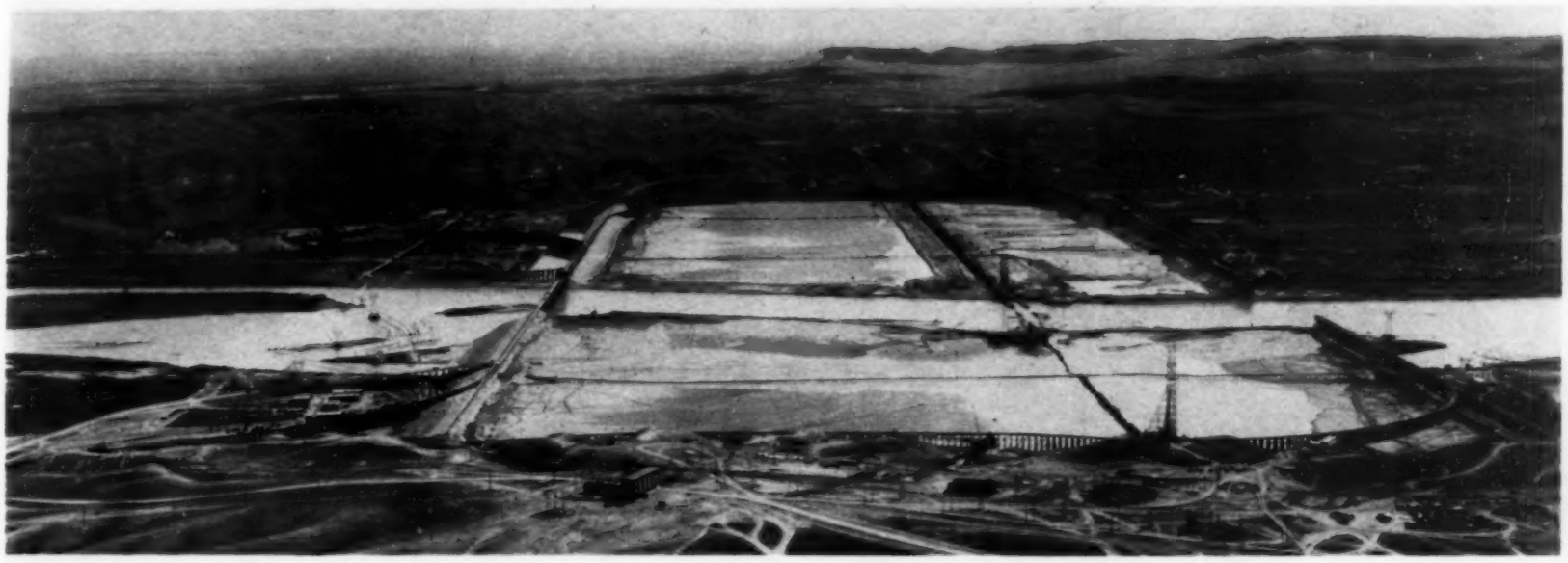
BIG BITE taken right out of the heart of Manhattan Island when old buildings, extending through several New York City blocks south of West 42nd St., are demolished to provide space for construction of plaza and approaches to Midtown Hudson tunnel, subaqueous traffic link between New York and New Jersey under construction with $37,500,000 of PWA funds.

NEW EAST RIVER DRIVE *(left)*, marginal highway to extend, ultimately, from the Battery to 125th St., New York City, is started with official ceremonies during which ground is broken by *(left to right)* General Hugh S. Johnson, Works Progress Administrator for New York district, Mayor Fiorello H. La Guardia, Robert Moses, Commissioner of Parks, and Samuel Levy, president of the Borough of Manhattan.

BEDROCK UNCOVERED at west abutment of Grand Coulee dam, being built across Columbia River in Washington by Mason-Walsh-Atkinson-Kier Co., for U. S. Bureau of Reclamation. Excavation at dam up to point illustrated has totaled 9,500,000 cu.yd.



CONSTRUCTION NOCTURNE. Catwalks of $77,600,000 San Francisco-Oakland Bay bridge in California are lighted to enable cable-spinning to proceed 24 hr. a day to meet schedule for completion of structure late in 1936, according to Chief Engineer C. H. Purcell. Photograph taken from San Francisco end of structure shows massive Pier W-1 in foreground with 500-ft. steel towers for suspension spans of West Bay crossing to Yerba Buena Island in center of San Francisco Bay.

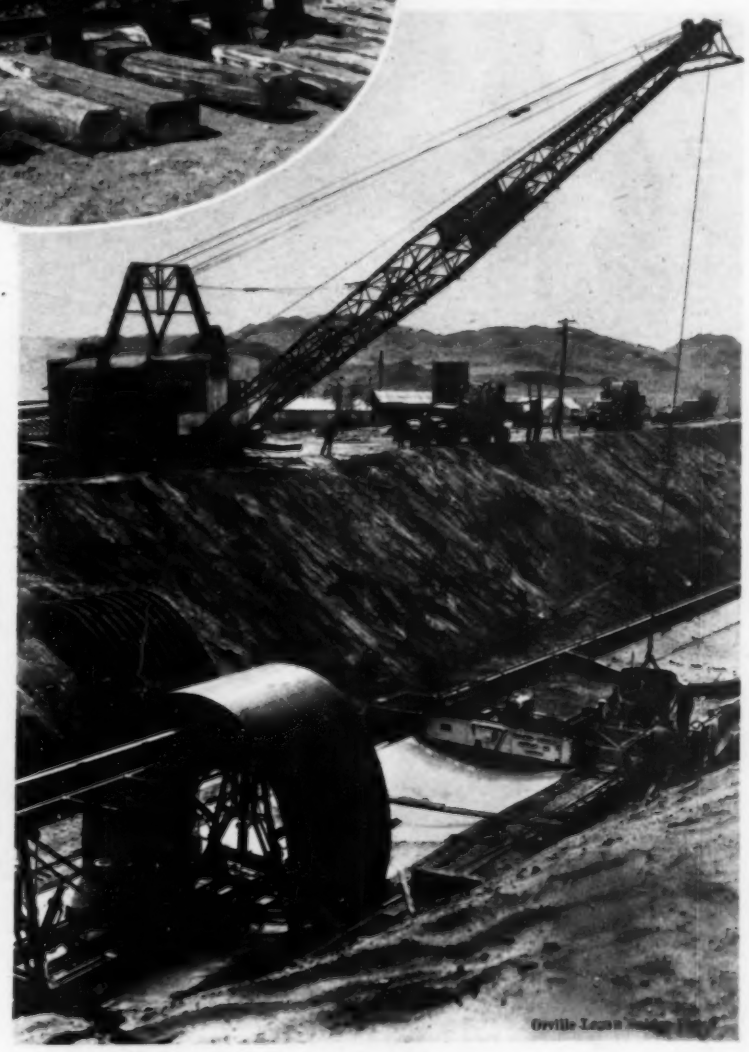


FORT PECK DAM across Missouri River in Montana will be world's largest hydraulic fill structure involving placement of 100,000,000 cu.yd. of material under direction of Corps of Engineers, U. S. Army, Major Thomas B. Larkin in immediate charge as district engineer. View shows broad base of structure, covering area 2,800x8,000 ft., being formed by discharge of four 28-in. suction dredges pumping 3,000,000 cu.yd. of material per month. Along axis of dam is cutoff wall of steel sheetpiling reaching depths of 140 to 190 ft. to bedrock. Encircling base of dam are bridge and railway trestle extensions for dumping gravel and rock along toe of structure.

CUT-AND-COVER SECTION *(below)* of Colorado River aqueduct in California is being concreted by Thompson-Starrett Co., Inc., using truck mixers to serve long-boom dragline machine equipped with bottom-dump bucket. Upon invert, completed with mechanical finisher, collapsible steel forms are set for concreting arch of section 16 ft. high and 18 ft. 10 in. wide.

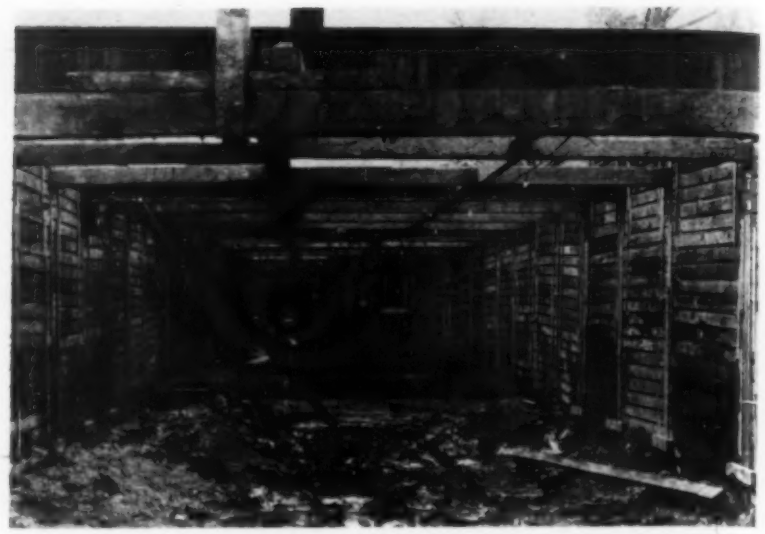
PASSAMAQUODDY PROJECT *(above and in oval)* for development of tidal power at Cobscook Bay, near Eastport, Me., gets under way as forces under direction of Major Philip B. Fleming, Corps of Engineers, U. S. Army, rush preliminary work on mess halls, camp buildings and railway line for delivery of construction materials to project for which allotments of $10,000,000 of work relief funds was recently approved by the President.

SCHOOL DAYS are back again, this time at the Fort Peck dam in Montana, where a school house for children of the big army of construction workers on the U. S. Engineer Department project was erected immediately after construction of the dam was begun.



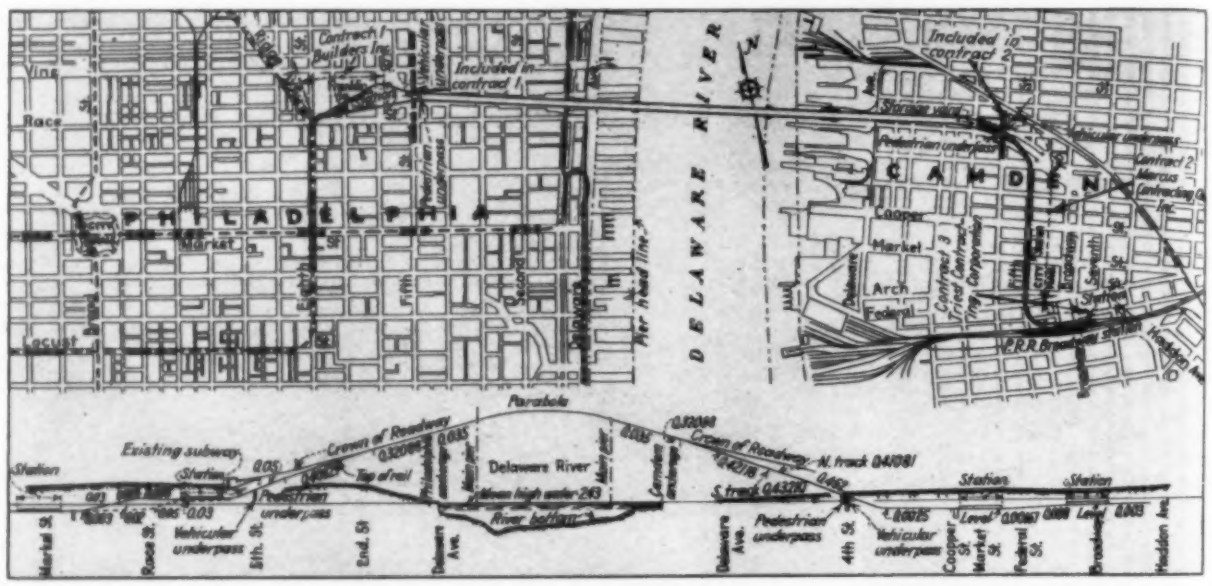
SUBWAY CONSTRUCTION

For High-Speed Philadelphia-Camden Rail Line



HORIZONTAL TIMBER SHEETING, bearing against flanges of vertical H-section beams driven in advance of excavation, retains earth banks on two sides of subway cut in Philadelphia.

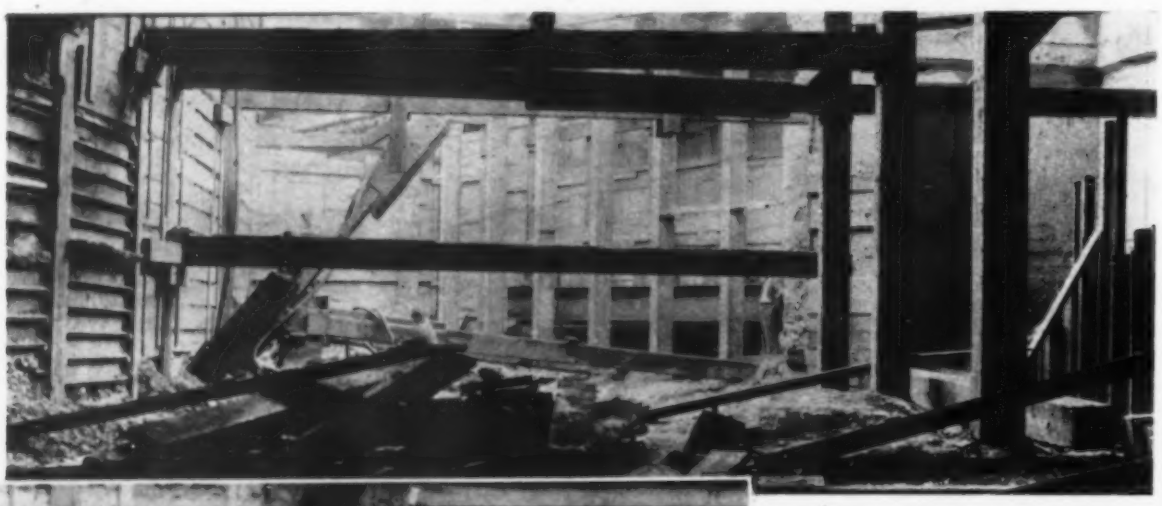
CARRYING out a plan originally provided for in the design of the Delaware River suspension bridge, completed in 1926, the Delaware River Joint Commission of Pennsylvania and New Jersey today is constructing a rapid-transit line linking the business center of Camden with existing city-owned subways in Philadelphia. Utilizing facilities and structures built as part of the original bridge project, the present program, at an additional cost of about $10,000,000, provides a completely equipped double-track system connecting two subway stations in downtown Camden with the recently completed Ridge Ave.-Eighth St.-Locust St. subway in Philadelphia. Three subway contracts involved in the current work present variations from conventional practice both in design and in construction.

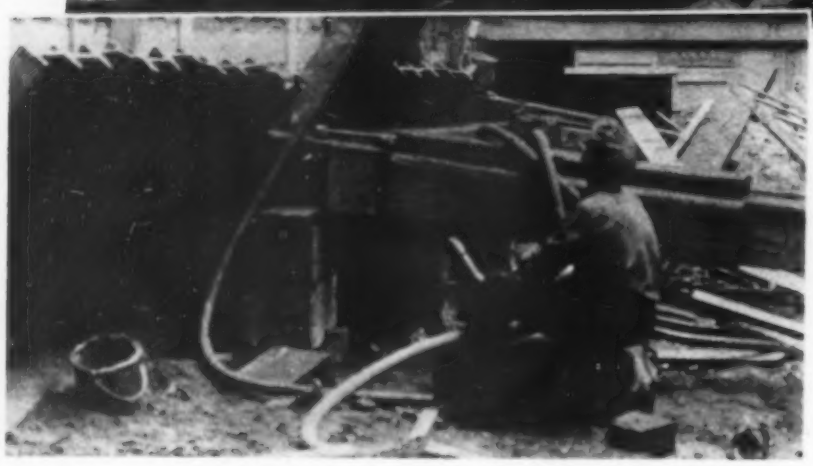


HIGH-SPEED RAIL TRANSIT LINE crossing Delaware River on suspension bridge connects Eighth and Market St. station on Philadelphia city-owned subways with two subway stations in Camden.

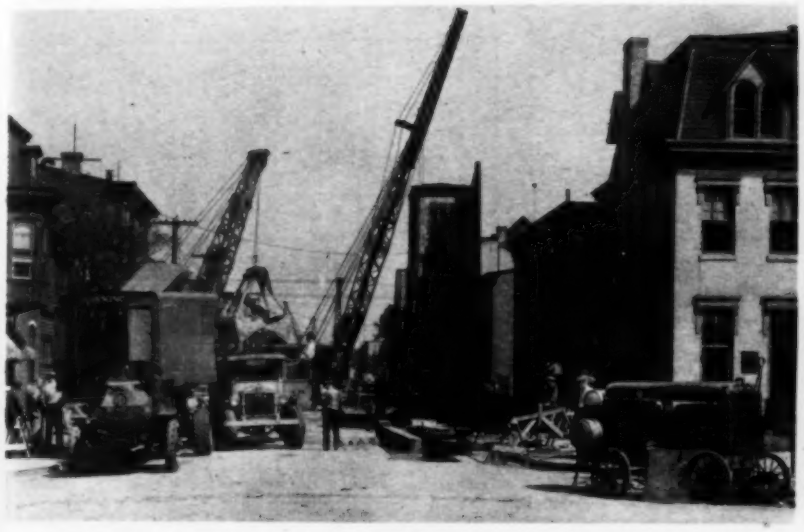
To retain existing structures and a railroad embankment in Camden and to control what preliminary borings indicated might be a difficult groundwater condition, the two subway sections on this side of the river were designed with permanent outside walls of steel sheetpiling driven 9 to 14 ft. below subgrade. Subway concrete is placed directly against this sheetpiling. On the section alongside the railroad embankment the subway contractor drove unspliced steel sheetpiles up to 58½ ft. long.

Steel H-section columns were utilized by the contractor on the Philadelphia section to resist the horizontal pressure of the earth banks. The columns were driven in advance of excavation and were braced across the cut as digging proceeded. In Camden, on the contract alongside the railroad embankment, where steel sheetpiles retained the earth, the sheetpiling was supported by precast concrete rangers wedged against similar temporary driven columns. On the Philadelphia section, where the de-

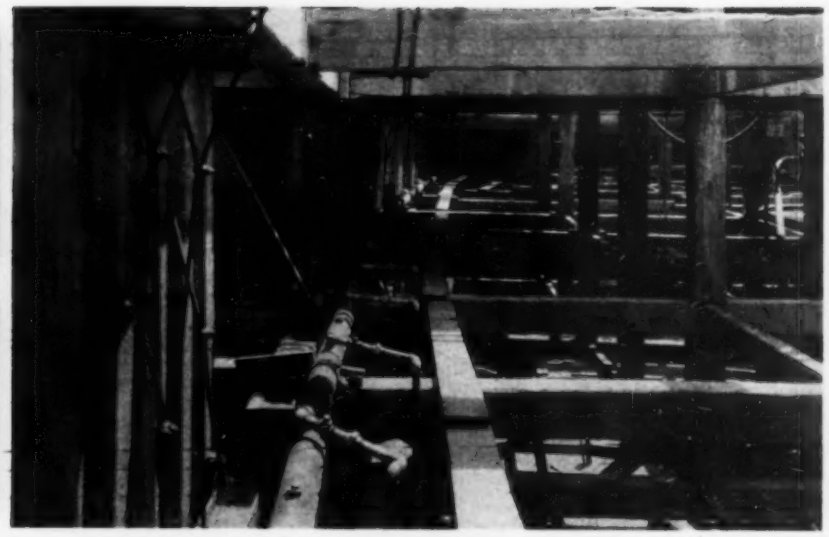




CLOSE TO BUILDING FOUNDATION in Philadelphia subway contractor substitutes ship channels for horizontal timber sheeting between vertical H-beams. TO CONSTRUCT PIER FOOTING *(left)* extending under building foundation, contractor drives solid row of I-beams at angle and, after excavating, places concrete against under side of these beams.



PRIOR TO EXCAVATION in Camden, subway builders drive lines of interlocking arch-web steel sheetpiles along two sides of cut.



SELF-JETTING WELL POINTS installed on 6-ft. centers along both sides of subway cut eliminate boiling in bottom on Contract 2 in Camden.

sign did not call for steel sheetpiling, the contractor installed horizontal timber sheeting against the flanges of the H-columns. Ordinary pumping methods served to drain the subgrade of this section, but in Camden one contractor paved the bottom with a concrete mat and the other operated two rows of well-points in advance of invert concreting. All three sections used ready-mixed concrete delivered by truck mixers from commercial plants. Cuts in streets were decked over to carry traffic during construction of the subways.

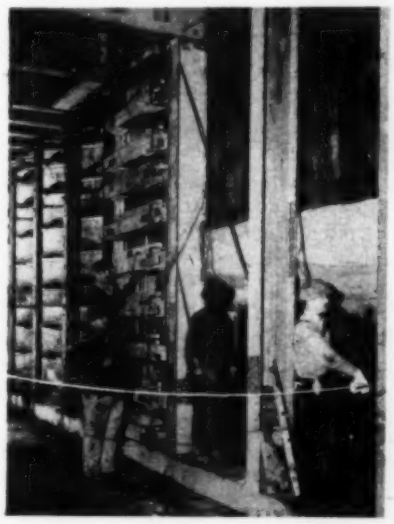
High-Speed Line—Track spaces for a rapid-transit line were provided outside the stiffening trusses of the Delaware River bridge. The Delaware River Joint Commission is now laying track across the bridge and building two single-track subways under Franklin Square to a connection with the Philadelphia subway at Eighth and Race Sts. In constructing its subway, the City of Philadelphia provided for this connection by building an undertrack crossover for west-bound trains of the high-speed line, eliminating crossing at grade. A new underpass had to be built in Fifth St. to carry vehicular and trolley traffic under the tracks of the high-speed line.

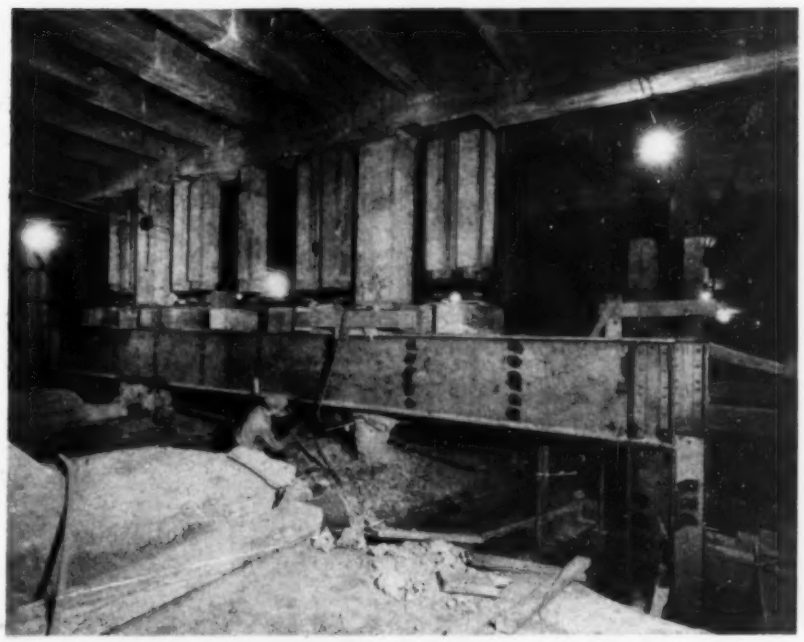
At the Camden end, the two tracks converge under the vehicular approach to the bridge and turn south in a double-track subway in Fifth St. to the tracks of the Pennsylvania Railroad, where the subway swings east parallel with the railroad. The subway's terminal (Broadway) Station, adjacent to the Broadway Station of the Pennsylvania and Philadelphia & Reading Railroads, provides for ready interchange of suburban passengers between the systems. A second subway station in Camden is known as City Hall Station. Plans for the Camden work called for a vehicular underpass in Fourth St. under the tracks of the high-speed line.

From Market St. in Philadelphia to the Broadway Station in Camden is 2.68 mi., and the running time between these terminals will be 9 min. The present $10,000,000 expenditure has been financed by sale of Joint Commission bonds to private bankers at a premium and by a PWA grant.

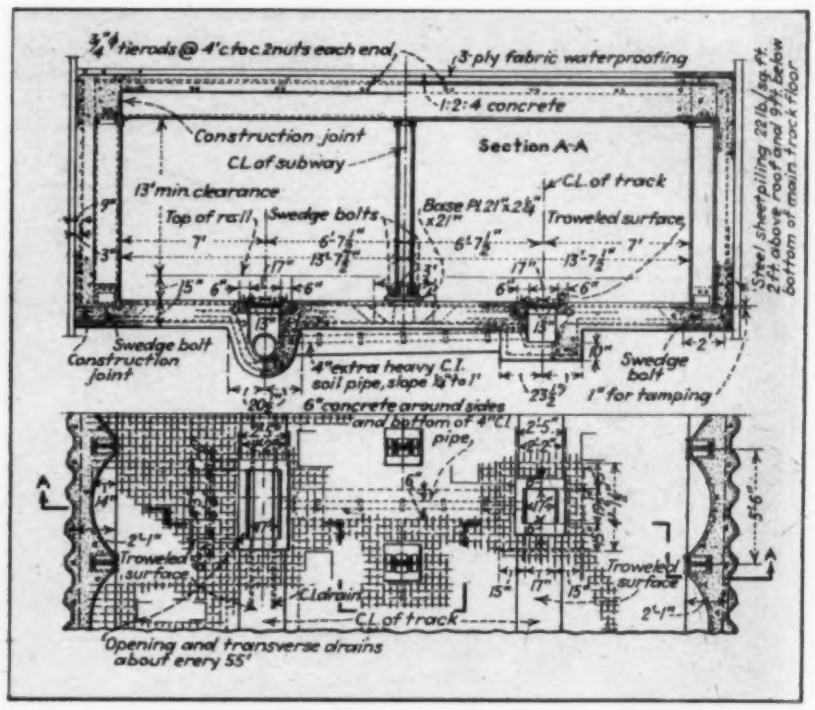
Subway Design—In general the design of the subway structure follows accepted practice in Philadelphia, with rectangular steel bents at 5½-ft. centers connected by concrete jack arches in the roof and side walls. Only the inner flange surface of the wall columns and roof girders is left exposed, the rest of these members being incased in concrete. The bents rest on a reinforced-concrete floor under which are placed track drains of cast iron (in Camden) or vitrified tile (in Philadelphia). Three-ply fabric waterproofing is applied to the roof 3 in. above the structural steel and is protected by a 3-in. layer of concrete. Station platforms are made 550 ft. long to take care of eight-car trains.

In the two Camden sections, interlocking arch-web steel sheetpiling was driven along both sides of the subway trench in advance of excavation. To save concrete, the sheetpiles were installed with the arch webs facing uniformly toward the subway structure. Along the Pennsylvania Railroad embankment, where plans called for removal of an existing stone masonry retaining wall, it was necessary to provide some means





WHERE SUBWAY PASSES UNDER BRIDGE APPROACH in Camden, contractor erects permanent subway bent and transfers load to steel before cutting out reinforced-concrete columns.



CONCRETE WALE *(left,)* with arched inner surface to permit flow of concrete from above, transfers horizontal thrust of sheetpiling to permanent subway steel. Wooden forms for wall arches are used only where ventilator drains are incorporated in wall. TYPICAL SECTION *(right)* of double-track subway in Fifth St., Camden. Note lines of interlocking sheetpiles on both sides of subway structure.

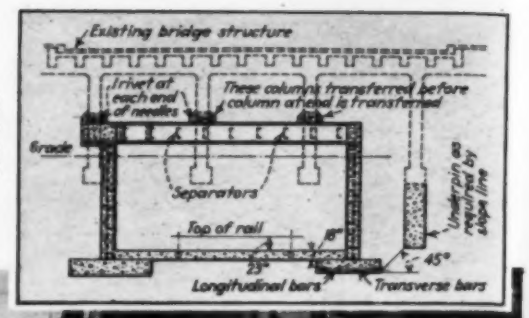
of holding the fill against settlement during construction of the subway. Elsewhere in Camden, preliminary borings indicated a mean high water level (governed by the stage in the Delaware) of 13 ft. above subgrade and 10 ft. above the lowest point in the subway track. The borings also indicated that the cut would be made in sand, sandy clay, river mud, gravel and fill. Along Fifth St., the subway route is lined with buildings, mostly one to three stories high resting on foundation wall footings. One six-story structure rests on concrete piles. To avoid difficulty with groundwater, flowing sand and possible settlement of structures, Modjeski, Masters & Case, the engineers for the Joint Commission, determined to line both sides of the subway with steel sheeting. The piles were driven to 9 ft. below subgrade in Fifth St. and to 14 ft. below subgrade adjacent to the railroad tracks. Along the opposite side of the trench at the Broadway station they were required to penetrate to 10 ft. below subgrade.

Subway Contracts—Contracts for the three subway sections were awarded as shown on the accompanying plan: No. 1 to Builders, Inc., of Philadelphia; No. 2 to the Marcus Contracting Co., of New York City; and No. 3 to the Triest Contracting Corp. of New York. Values of the contracts were estimated at the time of the awards as follows: Contract 1, $998,394.15; Contract 2, $1,373,-999.06; and Contract 3, $957,694.

Contract 1—No major construction difficulties were involved in building the two single-track subways and the station in Franklin Square, Philadelphia. At only two points did the subway line run close to standing buildings. Most of the excavation was made in open park and in dry soil.

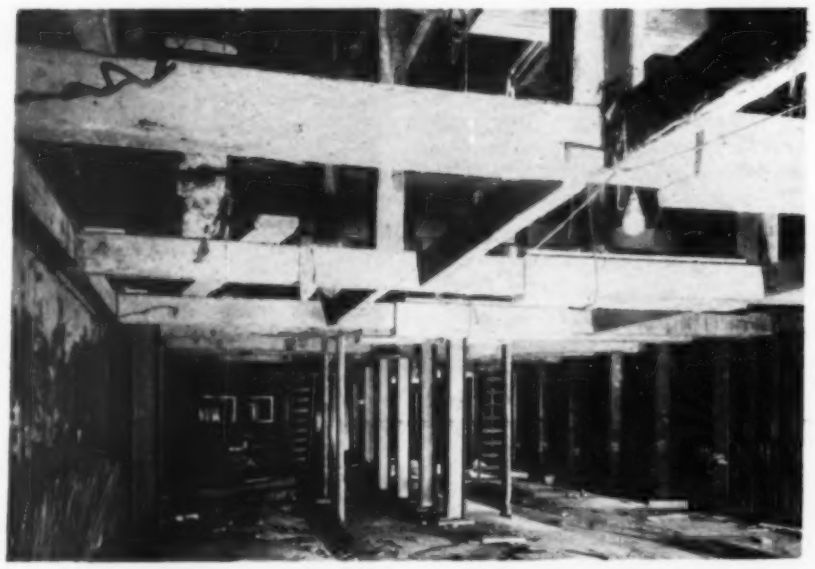
Builders, Inc., the contractor, drove H-section columns along the sides of the trench and excavated in stages with power shovels, hauling the spoil out of the cut in trucks. The H-section posts were installed on 11-ft. centers, and horizontal timber sheeting was placed between them as excavation proceeded. This sheeting bore against the inside flanges of the H-columns which were braced across the cut. Accompanying photographs illustrate the sheeting methods employed on this contract. Concrete was placed against the sheeting and vertical H-columns, which remained permanently in the earth.

At one point where a building imposed a greater load on the sheeting, the contractor substituted ship channels for horizontal timbers. This sheeting carried the additional load without any settlement in the building and saved the cost of underpinning the structure. At another point where it was necessary to construct a pier footing that extended partially under the foundation of a building, the contractor drove a solid row of I-section steel piles on an angle to prevent loss of ground above the footing. Earth was excavated under the piles to the proper limits, and footing concrete was cast in the excavation and was packed solidly against the bottom flanges of the I-section piles. The projecting ends of the piles were burned off. This method likewise saved an underpinning operation.

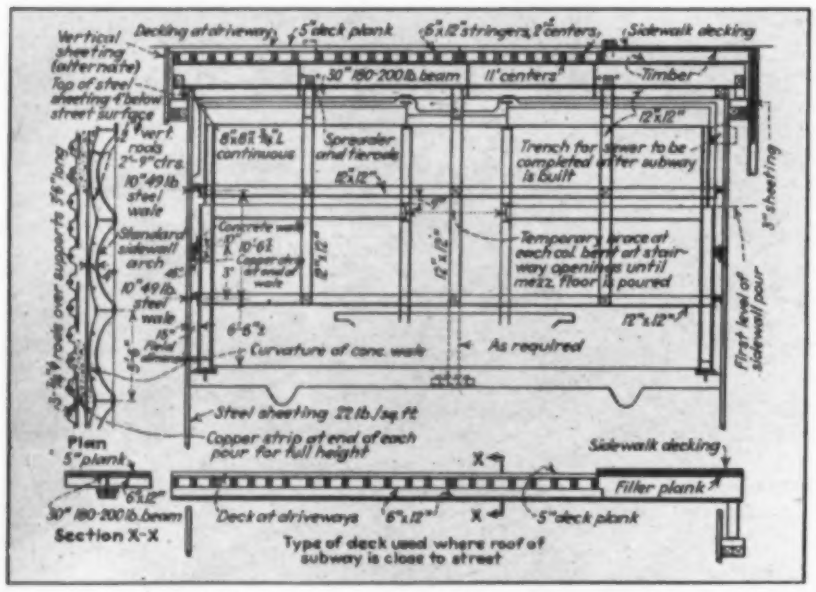


BRIDGE APPROACH *(right)* **in Camden is supported by steel bents where subway passes under existing structure.**

TRUCK MIXER on street decking discharges concrete into elephant-trunk spout delivering to subway structure.



STEEL WALES and timber cross-bracing will be removed after horizontal thrust of steel sheetpiling has been transferred by means of cast-in-place concrete wales to permanent steel bents now being erected.



BRACING AND DECKING in wide section of subway cut on Contract 2, Camden. Note shape of cast-in-place concrete wale as shown in plan and section.

Contract 2—On its section extending about 2,300 ft. from the bridge connection to Fifth and Federal Sts., Camden, the Marcus Contracting Co., Inc., drove 1,700 tons of Carnegie interlocking arched-web steel piling 30 to 40 ft. long weighing 22 lb. per square foot. The sheeting was driven between guide rangers in a trench with a McKiernan-Terry 9-B-2 hammer operated by compressed air. After driving sheeting on both sides of the trench to 9 ft. below subgrade the contractor made a surface cut of 8 or 10 ft. to water level by clamshell and installed 30-in. 180-lb. beams supported on timber cribs outside the sheeting to carry the street decking. The rest of the excavation was removed by clamshell through deck hatches. As the excavation proceeded, the steel sheetpiling was supported by steel wales and timber cross-bracing, as indicated by an accompanying drawing.

Underpinning of adjacent buildings was entirely the responsibility of the contractor. In bidding on the project, this item called for a lump-sum price and assumption of full liability by the bidder. All the buildings (except one on concrete piles extending below subgrade) were underpinned by 12-in. pipe piles located at points of concentrated load and jacked to a penetration below the bottom of the steel sheetpiling.

Before jacking down the piles, the contractor carried all wall foundations to water level, usually 6 to 8 ft. below the old bottom of wall, and reinforced those foundations which were too weak to stand the pipe-jacking operation. In some cases, the foundation walls were placed on reinforced-concrete beams spanning between pier caps on the pipe piles. The pipes were blown out and filled with concrete. In general, the underpinning operations preceded the driving of adjacent steel sheetpiling.

Cranes on the deck mucked out the cut to within about 6 in. of subgrade, and fine grading was completed by hand. The contractor's first excavation to subgrade in deep cut was at the north end of the Fifth St. tangent. To eliminate boiling in the bottom at this point, the contractor installed a system of Complete self-jetting 1½-in. well-points and continued to use the system to the south end of the contract. Well-points 20 ft. long were jetted at 6-ft.

TEMPORARY TRENCH sheeted with horizontal timbers between driven vertical beams aids setting and driving of interlocking steel sheetpiles along two sides of proposed subway cut on Contract 3, Camden.

centers along both sides of the trench and were connected to 6-in. headers drained by one Complete 6-in. high-vacuum well-point pump. A reserve pump was installed at an advanced location when it became necessary to move the pumping unit ahead.

Well points were left in place 1 day after invert concrete had been placed. The invert was concreted in sections about 45 ft. long. To facilitate removal of the well points, each point was inclosed in a stove-pipe sleeve against which the invert concrete was placed. After withdrawal of the well points, the stove-pipe holes were dry-packed with concrete. Tile drains were placed under the two edges of the invert to hold down the ground-water pressure until the addition of subway side walls and roof would provide sufficient weight to resist this pressure. To assure a tight seal of the stove-pipe holes in the invert, these holes were located under the side walls.

After erection of the rectangular subway bents on the reinforced-concrete invert, the horizontal thrust of the steel sheetpiling was transferred to the permanent columns by means of concrete wales cast in place. As soon as these wales attained sufficient strength, the contractor removed the temporary steel wales and timber struts and placed the arch forms for the concrete walls. It will be noted from the drawings and photographs that the cast-in-place concrete wales were curved between steel bents to permit unobstructed flow of concrete from the top of the wall form to the bottom. The concrete wales also were beveled on the bottom as shown to assure that a solid fill of concrete would be placed against this portion of the wale.

Concrete was delivered by elephant trunk spouts from deck hoppers charged by truck mixers. Specifications required that concrete in side walls and roof be vibrated internally. The contractor used electrically powered flexible-shaft vibrators for this work. Blaw-Knox steel jack forms were used for both roof and side walls except where construction of ventilator drains in the side walls made substitution of special wooden forms necessary Ordinarily the contractor concreted six bays in one operation. The steel roof arch forms were designed with adjustable haunches to fit various heights and widths of arch.

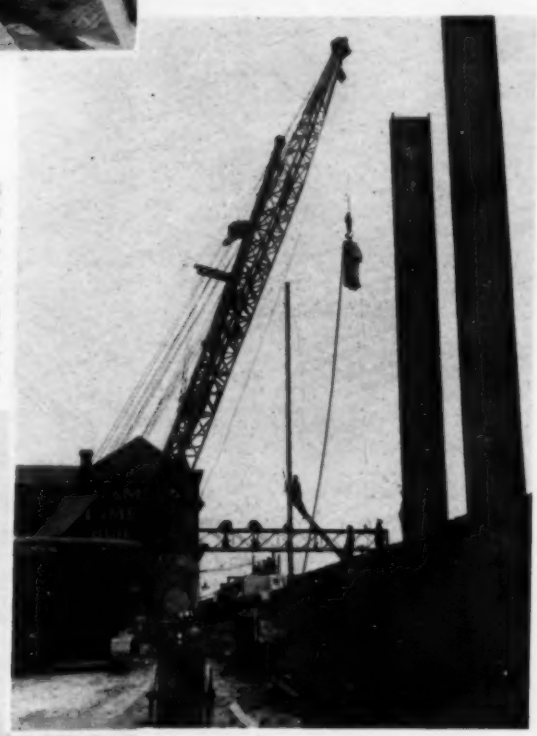
In constructing the portion of the subway under the vehicular approach to the bridge, the contractor transferred existing piers and columns of the approach substructure to supports on the permanent subway steel and built the roof and side walls of the subway before excavating the earth core. In transferring existing piers and columns to new supports, the contractor first jacked up the existing structures where necessary to permit partial demolition of concrete prior to steel erection. The full load was transferred by jacks to the permanent steel to obtain full deflection before the new grillage base of the pier or column was concreted.

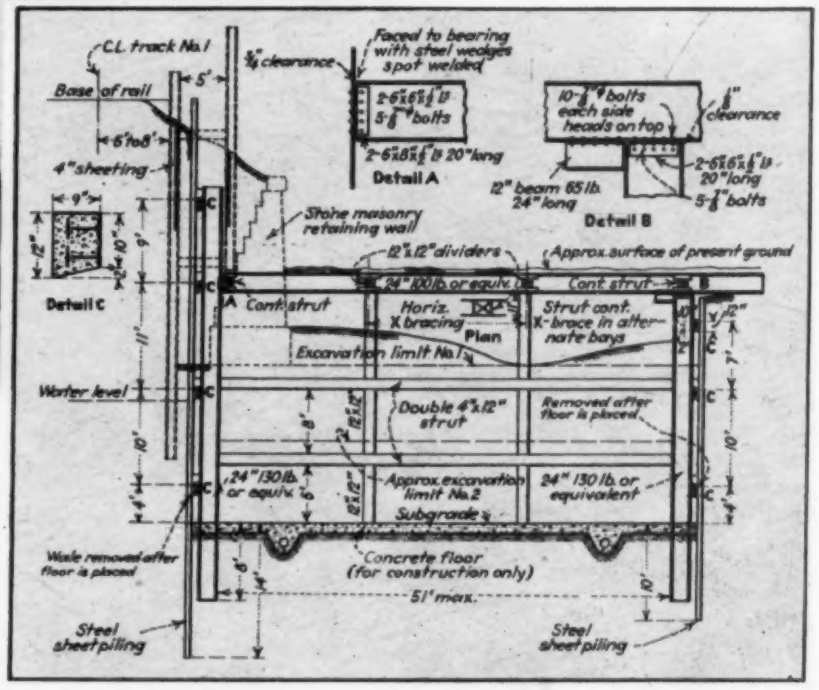
As in the Philadelphia underpass, steel bents at 5½-ft. centers and concrete jack arches were used in the vehicular underpass in Fourth St., Camden, included in the Marcus contract. This underpass has a total length of about 670 ft. and a covered length of 43 bays, or 236½ ft. Well points were utilized to dry out the permanent drainage sump during construction.

Contract 3—Special problems of importance were involved in the construction of a subway adjacent to the operating tracks of the Pennsylvania Railroad on the Triest Contracting Corp. section, where 58½-ft. interlocking steel sheetpiles had to be driven at a distance of 5 ft. from the nearest track rail, laid on an embankment 21 ft. above street grade. In 1,333 ft. of subway in this contract, the contractor drove 1,400 tons of Bethlehem interlocking arch-web steel sheetpiles. Adjacent to the railroad embankment sheetpiles weighing 27 lb. per square foot of wall were driven to 14 ft. below subgrade along the railroad side of the subway and to 10 ft. below subgrade along the low side. In the curved portion of the subway approaching the railroad embankment from Fifth St., sheetpiles weighing 22 lb. per square foot were driven on both sides of the cut to 10 ft. below subgrade. As part of this contract, the contractor removed an existing stone masonry retaining wall along the railroad. Accompanying photographs and drawings indicate the methods of driving the sheeting and of bracing it during construction of the subway.

Temporary trenches 10 to 12 ft. deep sheeted with horizontal timbers between driven steel columns, as indicated by one of the sketches, facilitated the setting and driving of the steel sheetpiles. From the temporary steel columns, the contractor hung timber guide bents to maintain the steel sheetpiles in vertical position. To assist in holding the sheeting vertical in both directions, the con-

58½-FT. SHEETPILES *(at right and below)* are set and driven close to operating tracks on railroad embankment. Following installation of sheetpiles, contractor drives vertical steel beams in temporary trench along inside face of steel sheeting.





BRACING SYSTEM on Contract 3, Camden, supports steel sheetpiling on two sides of subway cut adjacent to railroad embankment. Precast concrete rangers reinforced with two steel I-beams (Detail C) are wedged in place to transfer horizontal load on sheeting to temporary 24-in. vertical beams driven on 11-ft. centers (every second subway bay).

tractor set about 30 piles at one time and drove them in progressive stages which varied according to the length of piles and driving conditions. As a result of the accurate setting and driving methods, the sheets were driven in almost exact horizontal and vertical alignment.

After installing steel sheeting to grade on both sides of the subway cut, the contractor drove 24-in. 130-lb. vertical beams at 11-ft. centers (every second subway bay) in the temporary trenches along the inside faces of both sheetpile walls. These beams, driven to 8 ft. below subgrade, are shown on the accompanying section. To transfer the horizontal pressure on the steel sheeting to these temporary columns (or "soldier beams", as they are known on the job) the contractor wedged precast concrete rangers containing two steel I-beams (see detail drawing) between the sheeting and the soldiers in both trenches. With the soldier beams and top rangers in proper position in both trenches, the contractor made a shovel cut 8 to 12 ft. deep and placed a steel top strut between soldier beams on opposite sides of the cut. The cross-strut was bolted to the soldier beams.

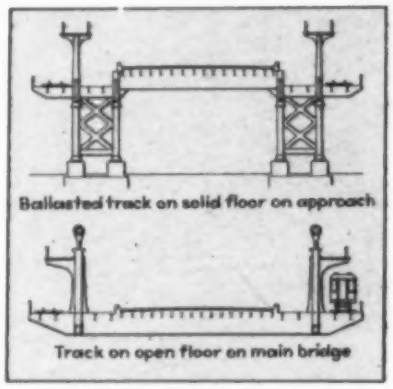
Following the first cut, excavation was continued by clamshell bucket hung from the boom of a crane which traveled on the ground along the cut or on timber pads laid on the top struts. As excavation proceeded, the contractor placed double 4x12-in. timber struts at two levels in each temporary bent (as indicated by the cross-section drawing) and wedged additional precast rangers between the steel sheeting and the soldiers to assure reinforcement of the sheetpiles against horizontal load. After completing the excavation, the subway crew laid permanent track drains of 10-in. cast-iron pipe and placed a 10-in. concrete mat (with the top at subgrade elevation) to furnish a dry bottom on which to work. The track drains conducted all water to a single sump from which it was pumped by two diaphragm pumps.

On top of the concrete mat the contractor built concrete bases to exact elevation for the permanent subway steel and erected the complete bents on these bases. The horizontal load was transferred from the temporary soldier beams to the permanent subway steel by driving steel wedges between the concrete rangers and the permanent columns. After wedging the rangers in this way, the contractor was able to take out the temporary bents. The temporary soldier beams were burned off about 3 in. below the top of the subway floor, and the lower ends were left in place.

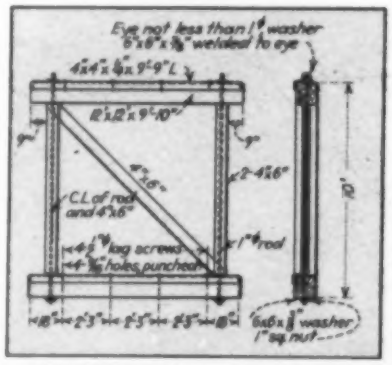
Unbalanced loading on the two sides of the subway cut, resulting from the greater height of embankment on the railroad side, caused no difficulty or serious movement in the temporary bracing. Driving of long sheetpiles close to the railroad track produced some consolidation and about 2 in. of settlement in the railroad fill, although the embankment had stood for 30 years without settlement. At one location the unbalanced loading on the subway shoring was accentuated by a drop of 8 ft. in the ground level on the low side for 160 ft. adjacent to a building. This drop produced a difference in elevation of almost 30 ft. between the top of the embankment and the ground on the low side. The temporary bents took the unbalanced pressure at this location with a maximum movement at the top of ½ in.

Administration—For the Delaware River Joint Commission, Ralph Modjeski is chief engineer and Modjeski, Masters & Case, Inc., are consulting engineers on design and construction of the High-Speed Line. Montgomery B. Case represents both the chief engineer and the firm on the project. Stephen Harris is engineer of design for the Joint Commission and C. L. Appleton is construction engineer.

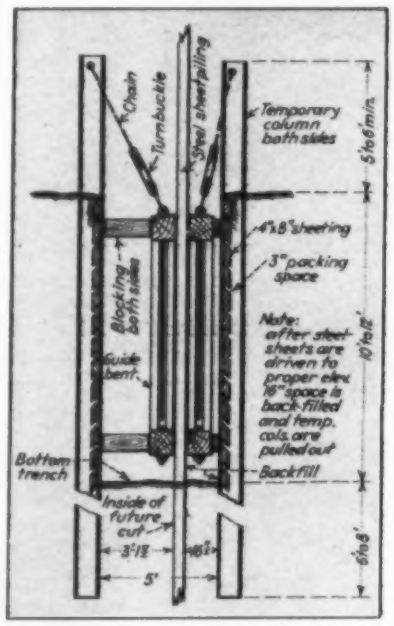
For the Triest Contracting Corp., John Hogan is chief engineer, and Jacob Siebert is superintendent in charge at Camden. Operations of the Marcus Contracting Co., Inc., are directed by Mandel Marcus, vice-president. D. C. Corwin is chief engineer. The work on the Philadelphia contract section is managed for Builders, Inc., by Perry Goldman, chief engineer and Carl Pierson, general superintendent.



ORIGINAL BRIDGE DESIGN provides track spaces for high-speed rail line on cantilevered brackets outside trusses.

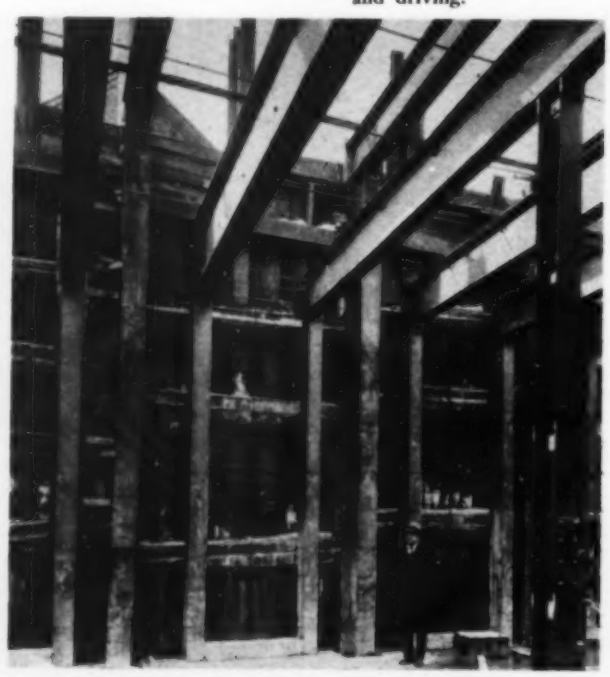


GUIDE BENT for use in temporary trench is designed to hold interlocking sheetpiles in alignment on Contract 3.



SUSPENDED IN TRENCH from tops of temporary driven beams, pair of guide bents holds sheetpiles in vertical position during setting and driving.

AFTER MAKING SHOVEL CUT, contractor places steel top struts between vertical beams on opposite sides of subway trench adjacent to railroad embankment and continues excavation by clamshell, installing timber bracing as digging proceeds.



PRECAST CONCRETE WALES *(left)* in which I-beams are incorporated transfer load on sheetpiles along railroad embankment to vertical beams braced across cut by steel and timber struts. **FOLLOWING ERECTION OF SUBWAY BENTS** *(right)*, horizontal load is transferred to permanent steel by driving steel wedges between concrete rangers and subway columns, and timber bracing is removed. Temporary vertical beams will be burned off just above surface of concrete construction mat on bottom of cut.

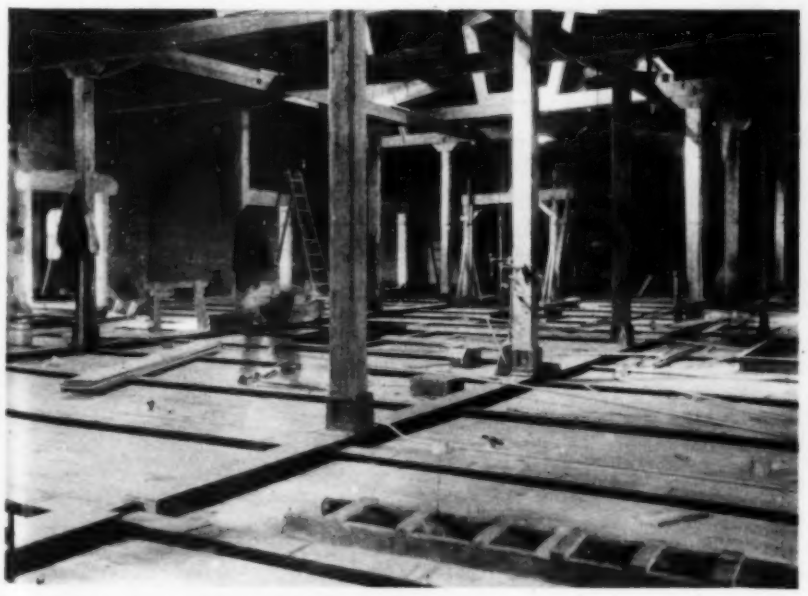
Twenty Contractors Enlarge Capacity of *OLD BROOKLYN BREWERY*

EXISTING BREWERY is remodeled to increase capacity from 200,000 to 1,000,000 bbl. a year. Wood frame of bottle storage building (appearing directly under tall brick smokestack) is replaced with steel frame.

TO remodel and enlarge an existing plant which it had recently acquired, Kings Brewery, Inc., of Brooklyn, awarded separate contracts covering such items as underpinning, shoring, steel erection, concrete and brick masonry, floors, partitions, roofing, painting, insulation, piping, plumbing, lighting, pumps, motors, boilers, tanks, elevators, conveyors, and mechanical bottling equipment. More than twenty contractors were engaged in the actual construction work, which increased the capacity of the brewery from 200,000 to 1,000,000 bbl. a year. A force of 500 men, in the employ of the contractors, worked 5 days a week, in accordance with the rules of the New York City building trades, and an additional force of 100, in the maintenance and operating crew of the owner, was busy 6 to 7 days each week. Renovation of the brewery entailed a total expenditure of almost $2,000,000, of which $700,000 was specifically for contract work and the remainder for equipment and construction materials purchased by the owner.

Construction Organization — Complete control of construction, as well as design, was placed by the owner with the firm of Shampan & Shampan, architects, of Brooklyn. This firm took bids, awarded contracts, and supervised the execution of the work. The architects furnished plans and specifications to a selected list of contractors and invited bids on a lump-sum basis. This method of fixed price bidding protected the owner from the many uncertainties involved in the cost of doing repair and alteration work. On the other hand, it placed a heavy responsibility upon the contractors and demanded a close study of the specifications and thorough preliminary inspection of the condition of structures which were to be repaired or remodeled.

BOTTLE STORAGE BUILDING is modernized by substitution of steel frame and concrete floors for old wood construction. Platform hoist, in right background, raises concrete to second floor.



FORMS *(below)* **for cinder-concrete slab and steel incasement on second floor of bottle storage building are suspended from upper flanges of I-beams.**

Condition of Brewery—When taken over by Kings Brewery, Inc., the plant consisted of a combination brew and stock house more than 50 years old and a bottling plant and bottle storage building about 30 years old. Since 1918, the plant had been used intermittently and to partial capacity for the production of near beer, but little attention had been given to maintenance during this period. The brew house was a steel-frame and brick structure measuring about 250x100 ft. in plan and 120 ft. high. Across a narrow driveway from the brew house was the bottle storage building (originally a stable), a two-story, wood-frame, brick bearing-wall structure about 50x100 ft. in plan. Next to this building was the bottling plant, about 40 ft. wide and 75 ft. long, a more modern building with steel floor framing, concrete floors, brick load-bearing walls, concrete columns with cast-iron cores, and wood roof trusses.

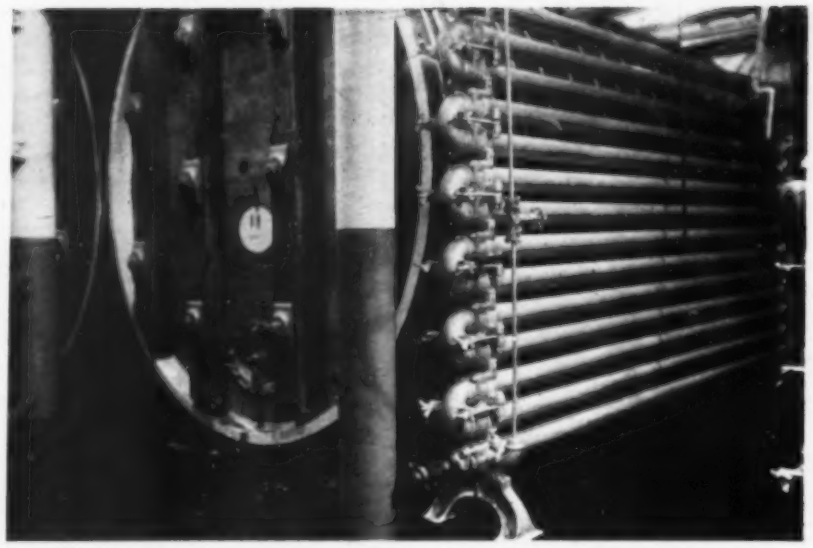
Reconstruction Operations—Structural changes in the buildings involved the installation of foundations and a steel frame to carry two new 65-ton kettles in the brew house, the replacing of the wood frame of the bottle storage building with a steel frame, the alteration of the steel frame of the bottling plant, the underpinning of the walls of the bottle storage building, and the construction of a government gaging cellar under the loading platform of the bottling plant. New concrete floors, with stone or gravel aggregate, were required in the basement of the bottling plant and on the first floor of the bottle storage building, and the old second floor of the latter building was replaced with cinder concrete arches resting on steel joists. Built-up roofing of tar and fabric, with gravel top, was specified for all three buildings, and the entire exterior of the structures was scheduled to receive two coats of paint. All exterior ornamental bronze sheets were removed, and structural steel on

the roof exposed by this process was given a coat of red lead and of paint.

Inside the brew house, cork board insulation on the walls of the fermentation and storage rooms was repaired or replaced, asphalt floors in the racking department were rebuilt, and several miles of pipe lines for cooling, heating, and transfer of beer were installed. Wherever new floors were constructed, the architects specified that new drains and drain pipes should be installed. A more efficient and more economical lighting system replaced the old ineffective illumination.

At the east end of the brew house, an additional story was added, providing a room about 50x100 ft. in size for increased racking facilities. Space for a first-floor office was inclosed with hollow-tile partition walls. A water tank was placed on the roof, and a new deep-well pump was installed to furnish a reliable supply from one of the two wells serving the brewery. To provide ready access between parts of the brew house, the owners installed a passenger elevator stopping at seven levels. Although the plant purchases electric power from the local utility company, its old steam plant was replaced with two 360-hp. water-tube boilers and pulverizers for coal. Old wood fermentation and storage tanks were banded with new steel hoops, and sufficient new tanks were installed to increase the total tank capacity to 50,000 bbl. An additional stock house later doubled this capacity. The entire interior of the brew and stock house, including the walls, steel frame and storage tanks, but not the fermentation tanks, was painted in two colors, gray and white.

Foundations and Underpinning — Walls of the bottle storage building were underpinned with brick masonry resting on concrete spread footings. The underpinning was installed in alternate 4-ft. sections to a depth of about 4 ft. below the surface of the ground. Concrete footings also were constructed for the new interior columns. For the government cellar under the loading platform of the bottling plant, an 8-in. concrete retaining wall resting on spread footings was installed in sections. The concrete for the wall, for footings, and for the bottom floors of the bottle storage building and of the bottling plant was a 1:2:4 mix, with either crushed rock or gravel as the coarse aggregate. Brick piers were constructed to carry the new steel frame in the brew house.



ROOM-COOLING COILS in stock house are one part of new refrigerating system requiring 4 additional miles of cast-iron pipe 1½ to 6 in. in diameter.

BOTTLING PLANT, at left, and bottle storage building are shored temporarily during reconstruction of piers and columns.

Shoring—A separate contract was let to a firm of shoring specialists to shore the bottle storage building and portions of the bottling plant. Inasmuch as the entire wood frame of the bottle storage building had to be removed and replaced with a steel frame, it was necessary to shore all walls and roof trusses of this building from the ground.

Several of the accompanying photographs illustrate the shoring methods which had to be employed in the bottling plant to permit removal of columns and construction of the government cellar. Several of the concrete columns with cast iron cores in the first story had to be taken out to allow the introduction of two new units of mechanical bottling equipment. Needle beams were employed at several points to support timber shores. In one case where a first-story section of iron column had to be removed it was necessary to install above the second-floor level needle beams spanning from timber shores to the wall of the building. Unsupported girders of the second-floor frame were suspended from these

STRUCTURAL FRAME for mechanical bottling equipment is introduced in floor of bottling plant. Mechanical pasteurizers appear in background.

VERTICAL PASTEURIZER TANK rests on concrete foundations in basement of bottling plant.

TO PERMIT REMOVAL of concrete-incased cast-iron column in second story of bottling plant and in story below, needle beams *(at left)* are installed above floor, spanning from timber shores to bearing wall of building. Chains and wire-rope slings around needle beams and grillage I-beams support girders of second-floor frame. Timber shores resting on needles support ceiling beams. **SIMILAR SHORING** *(in center)* carries upper floor beams during removal of column. **AT TRUCK ENTRANCE** to loading platform *(at right)* shores support spandrel beam while brick pier is rebuilt.

beams in chain and wire-rope slings, and ceiling girders were supported by timber shores resting on the beams.

Floors—A floor slab of 1:2:5 cinder concrete varying in thickness from 7 to 5 in. to provide pitch for drainage rests on the girders and joists of the bottle storage building's second floor frame. The joists were Bethlehem 6-in. 37-lb. I-beams spaced on 5-ft. 4-in. centers. A monolithic floor finish on this slab and also on the stone-concrete floors consisted of a 1:2 cement-sand mortar containing Anti-Hydro waterproofing and a metallic floor hardener (Sonneborn's). The floor slab was reinforced with welded wire mesh. Cinder concrete fireproofing of the columns and floor frame was placed simultaneously with the slab.

Forms for the second floor of the bottle storage building were of a type commonly employed for this kind of construction, the beam soffit forms being suspended by wire hangers from the steel joists and the beam side forms supporting transverse wood pieces upon which rested the bottom slab forms. The contractor erected the forms for the entire floor and placed concrete over the whole area in one continuous operation. A 14-S Leach mixer on the ground floor prepared the concrete, which was elevated to the second floor in wheelbarrows on a platform lift operated by a 40-hp. Lambert hoist.

Reconstruction of the bottle storage building provided a storage capacity of 250,000 cases. A complete system of inclined elevating conveyors and roller conveyors was installed to facilitate movement of filled and empty cases between all parts of this building and the bottling plant.

Floors of the racking rooms and storage rooms in the stock house have a 1-in. surface consisting of rock asphalt mastic containing grit and 10 per cent flux, making a waterproof finish. These floors were in poor condition in many places and required patching and resurfacing. Where necessary, a 2-in. cinder concrete fill under the rock asphalt floor was removed and replaced.

Insulation—Walls of the rooms containing the fermentation and storage tanks were insulated with two layers of 2-in. cork board, waterproofed with asphalt and painted. The new storage room on the roof had to be completely insulated, and large areas of wall insulation in several other rooms had to be replaced or installed for the first time.

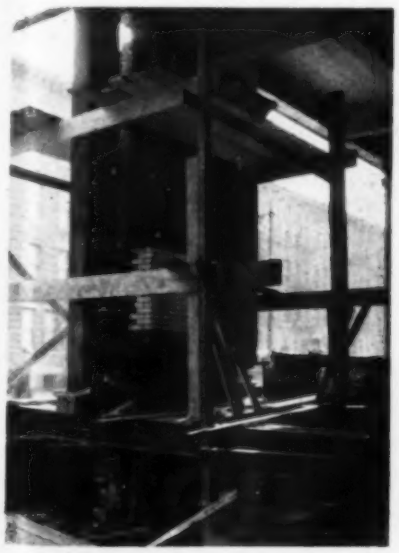
Plumbing—About 4,000 ft. of 3-in. to 4-in. cast-iron drain pipe was installed in the floors of the buildings. Water passes into these pipes through 8-in. cast-iron strainers in the floors laid with flashing pans and lead flashings 2 ft. square made watertight with the drains. The refrigeration plant, of the ammonia-brine type, was in good condition, but the brine circulation system required the replacement of old pipes with about 10,000 ft. of cast-iron 1½-in. to 6-in. pipes. New beer piping called for about 3,000 ft. of 2- and 2½-in. brass pipe. An interesting feature of the beer piping was the substitution of a stainless steel for copper in replacing several loops of a coil cooler in the refrigeration room through which the wort (unfermented beer) passes on its way to the fermentation tanks.

Water for the entire operation of the brewery is obtained from two wells, each equipped with a pump having a capacity of 500 g.p.m. At the older of these wells, a brick-walled shaft 132 ft. deep, the owner replaced the old pumping unit with a Layne five-stage deep-well turbine pump driven by a 40-hp. Westinghouse vertical motor. This unit, with its impellers 124 ft. below the surface of the ground, operates against a service head of 120 ft. and a total head of 222 ft. A new water tank of 15,000-gal. capacity was constructed of red Gulf cypress on the roof to serve the entire plant by gravity.

Electrical Installation—New motors were installed to drive mechanical equipment. Electric power for the entire plant is purchased from an outside source. A complete new lighting system replaced the old illumination, giving three times the light at one-third the power consumption. The Otis Elevator Co. installed an electrically interlocked and automatically operated elevator with a 5x5-ft. car which travels 100 ft. a minute and stops at seven floors in its total travel distance of 62 ft.

Tanks—In addition to placing new steel hoops around the existing tanks, the owner of the brewery purchased and installed a number of new tanks averaging 350 bbl. in capacity for fermentation and storage purposes. These tanks were fabricated in the shop and assembled in the brew house. The tanks were of both horizontal and vertical types, depending upon which type gave the greater capacity in a given room. Electric-arc welding played an important role in repairing the steel kettles and tubs in the brew house.

Supervision—Louis Shampan was in charge of design and construction for Shampan & Shampan, the architects. For Kings Brewery, Inc., George McElroy was plant engineer.



NEEDLE BEAMS resting on timber cribbing support timber shores on two sides of central brick pier at entrance to loading platform.

AFTER REMOVAL OF ORNAMENTAL BRONZE, painters apply red lead to exposed steel.

MILE-LONG CONVEYOR SYSTEM

Carries to Dump Spoil From Site of

GRAND COULEE DAM

A MILE-LONG belt conveyor system, with a gross lift of 543 ft., is removing excavated material overlying bedrock at the site of the Grand Coulee dam on the Columbia River in Washington and delivering it to a spoil bank at rates as high as 43,000 cu.yd. in 21 hr. While no precise figures can be given as to the total amount of material to be moved preparatory to placing concrete in the foundation of the 4,100-ft. long structure with an ultimate maximum height of 540 ft., (see *Construction Methods* for August pp. 30-32 and September, pp. 42-44) the present $29,339,301 contract of the Mason-Walsh-Atkinson-Kier Co. was based on a preliminary estimate of 11,-

GETTING DOWN TO BEDROCK. In west abutment pit three tributary conveyors for removal of spoil converge at surge feeder whence material is carried uphill by main line to Rattlesnake Canyon dump.

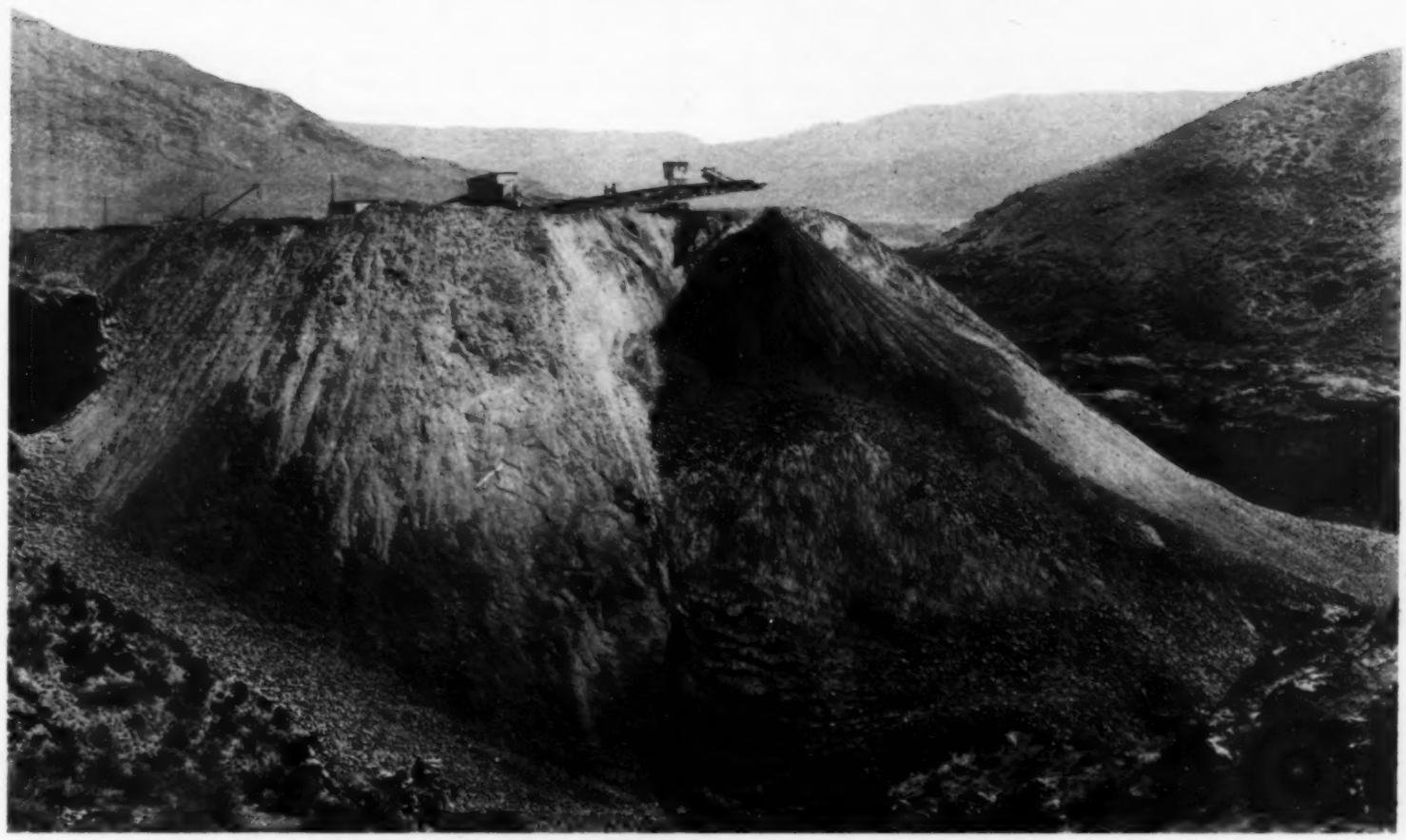
BIG BITES and short swings of power shovels *(above)* are the rule in excavating overburden behind cofferdam. Bulldozer assists in feeding grizzly and removes large boulders from grillage surface. Tractor-hauled crawler wagons loaded by power shovels dump spoil upon grizzly (right) which feeds belt conveyor.

000,000 cu. yd. of excavation, a total that recent developments indicate may be increased to 13,000 cu.yd., in addition to which earlier contracts and work yet to be done on slides will probably swell the grand total for the project to 17,000,000 cu.ft.

Construction operations have been concentrated upon uncovering bedrock within the area at the west end of the dam, walled off from the river by a 3,000-ft. long cellular steel sheetpile cofferdam. About 10,000,000 cu.yd. of spoil will probably be excavated from the west cofferdam area and moved to a point of disposal in Rattlesnake Canyon, a ravine above the dam site on the west bank of the river. For transporting this material a 5-ft. wide belt conveyor system, designed to carry 2,500 cu.yd. per hour, has been installed. Including the four feeder units, this system is now 6,048 ft. long and the gross lift is 543 ft. Both these figures will increase as the job progresses. Features of the belt conveyor system which started operating Dec. 13, 1934, are the arrangement of feeder units to obtain uniform loading, interlocking controls to prevent piling up of material along the line when trouble develops and a grouping of equipment at the discharge end of the line which gives great flexibility without interrupting operation.

Although the greater part of the job of moving material from pit to dump is done by belt conveyor, every yard of spoil that moves out on the belt is first excavated by power shovel and hauled to the belt feeders in motor trucks or tractor-drawn trailers; bulldozers play an inportant part in the operation.

Operation of Feeders—The main belt conveyor system starts at a hub centrally located in the cofferdam area, and the plan is to have several feeder belts continually supplying this hub. These auxiliary belt lines will be moved about as excavation proceeds.



SPOIL BANK in Rattlesnake Canyon. Delivery end of mile-long conveyor system is served by stacker belt boom which swings radially and moves forward, within limits, while flow of material continues to form 11,000,000-cu.yd. fill. Material stands first at 1 on 1 slope, but slips down to 1 on 5 slope.

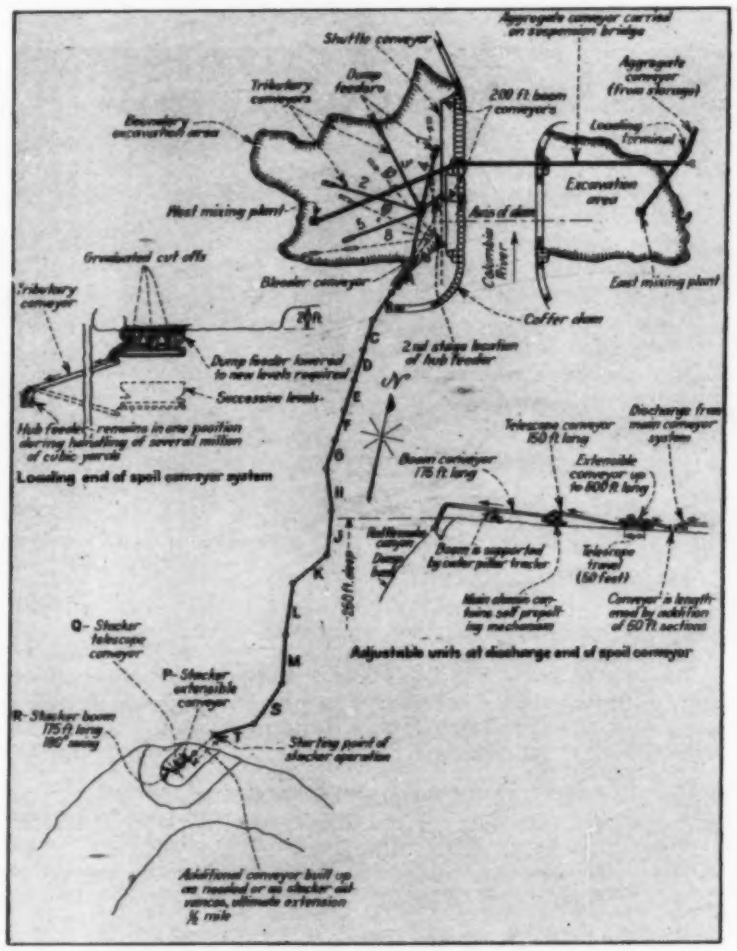
The intent is to keep about four feeder belts tributary to the hub, with one of the four always in process of relocation. Two feeders working at capacity could supply a full load for the main belt; it is expected that the other feeder belt will insure constant flow of material while time out is required on any one unit for repairs.

The scene in the cofferdam is one of ceaseless activity. Dump trucks and wagons hauled by tractors with capacities varying from 12 to 20 cu.yd. deliver their loads to a grillage of steel I-beams having 13-in. openings. Boulders that will not pass through the grillage are scraped off by bulldozers which continually clean up as dumping proceeds. The grizzly bars are of heavy, built-up, hollow sections with a slight taper downward.

Beneath the grizzly material falls into the hopper of a feeder which is a 65-ton assembly of structural steel and apron conveyor. Its function is to equalize the irregularity of dump truck deliveries and make the loading on the belts as uniform as possible. Above and along the sides of the movable apron of the feeder is a combination skirt and hopper that holds approximately 40 cu. yd. The skirt or side walls diverge toward the discharge end where their separation is greater by 12 in. than at the other end of the 30-ft. feeder belt. This flare tends to relieve the pressure in the side walls as the material moves out.

These feeder units are planked on their under sides and have steel shoe plates resembling skids to facilitate moving. Ordinarily they are placed in pits to lessen the grade up which material has to be hauled to dump into their hoppers. A feeder unit ordinarily is maneuvered into a new pit location by three tractors; one pulls, one works as a bulldozer to aid in slewing and one follows on a snubbing line to ease the feeder while descending into the pit.

The most important control point on the belt conveyor system is in the hub where the several feeder belts deliver to the main belt line. The length of truck haul from shovels to feeder units ranges up to 500 ft. or more. During the short hauls two feeder belts are sufficient to supply the main conveyor belt. Where the hauls become longer three feeder belts are used. The operator at the hub controls a surge feeder over the main belt. Its function is to load the main belt uniformly and at capacity. The operator's control over this function is by stopping any or all of the feeder belts when an overload begins to pile up in the surge feeder. The feeder belt units now in use are about 350 ft. long, but as the excavation progresses downward it is expected that two or more sucessive units in line will be required to lift material from lower parts of the excavation to the hub.



BELT CONVEYOR SYSTEM, showing how tributary conveyors in west cofferdam pit feed main delivery line extending to dump.

Main Belt Units—Beyond the hub feeder the main conveyor belt, 60 in. wide, with a speed of 620 ft. per minute, moves the material, in 19 conveying units, to the spoil bank in Rattlesnake Canyon. On June 1 the length of the main belt line was 4,648 ft., to which the addition of 1,400 ft. in feeder belts brought the total to 6,048 ft. The length of the main line will be increased as the fill at the dump advances, probably to an ultimate total of more than 1½ mi. The main belt was designed for 2,500 cu.yd. per hour or 52,500 cu.yd. per 21-hr. day. It is expected that with well regulated operation the capacity will considerably exceed this figure. Thus far the maximum day's yardage has been 43,230 cu.yd.

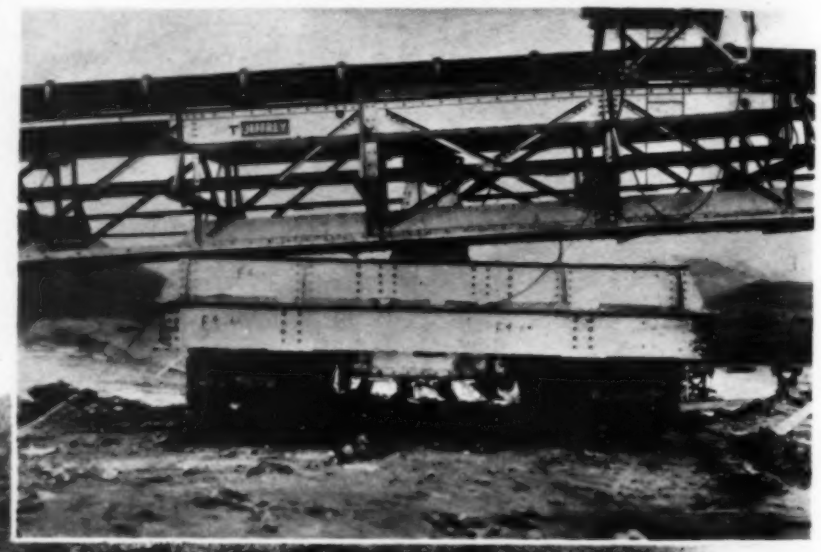
Each of the 19 belt units is powered with a 200-hp. electric motor equipped with reduction gears and a V-belt drive. The lengths of conveyor units vary with the grade. The shortest is 156 ft. long

and has a 14-deg. slope; the length of the longest is 415 ft. Each unit drops the material 6 to 8 ft. in making the transfer from one belt to the next. The 8-ft. loss occurs at angle points where more headroom is required; the 6-ft. drop is sufficient for a "straight along" transfer point. These transfers are not made with a chute as the discharge from one belt is directly on to the belt below. To aid in carrying the impact which this drop involves, larger rubber covered idlers are used for a length of about 8 ft. where the belt receives its load.

While overburden was being removed from the cofferdam and rocks were frequent in the material, a piece of old railroad rail was used as a "splitter," and was mounted just above the receiving area on a belt to receive the impact of falling rock. Now that excavation has gone down to a level where rock is less frequent and the material is more sticky, a tendency for the material to pile up on the splitters made it desirable to remove them. On June 15 the lowest feeder grizzly was at El. 925 and the surface of the spoil bank at El. 1360, a net lift of 435 ft. To obtain the gross lift there should be added a loss of 160 ft. representing the drops at the grizzlys and at the successive transfer points; a total lift of 595 ft. Power consumption records indicate that with the set-up here used actual power requirements are 4 hp. per foot of lift, horizontal transportation excluded. This is based on the average weight of material and a delivery of about 4,000 tons per hour.

At the upper end of each unit a house encloses the driving mechanism and each of these points is a control station from which the operation of the belt motors may be stopped. The control for each motor is interlocked so that starting and stopping is in a predetermined sequence. When the stop button is pushed at any point the preceding conveyors only are affected; the succeeding conveyors continue on with their load. Similarly, when starting from any point the feeding conveyors only are started and buttons in each has been roofed over to shelter belt and workmen from sun and rain.

The main conveyor belt is about 3/4 in. thick and consists of eight-ply fabric with a 5/32-in. rubber cover. The fabric is a 32-oz. duck in the main belt and in the telescope units at the discharge end, 42-oz. duck is used. When conveying earth and soft material the



TURNTABLE *(right)* and pivotal mounting of conveyor boom on crawler chassis.

STACKER at dump end of long belt conveyor line is extensible and is self-propelled. Discharge boom 175 ft. long swings in arc of 180 deg. to distribute material.

FEEDER UNIT of conveyor system ready to be skidded to new location beneath surface. Apron conveyor discharges material dropping through grizzly on to the tributary feeders.

successive unit must be pushed to bring the entire belt system into operation.

A walkway paralleling the belt connects the head houses in each of which there is a telephone. In normal operation one man is sufficient for every four or five head houses. All driving parts are interchangeable and are mounted on self-contained steel frames. Counterweighted gravity take-ups are used. Idler spacing under the loaded belt normally is 42 in. and under the return belt 7 ft. The main conveyor line belt shows very little wear but a large percentage of rock or large rocks wear and sometimes tear the fabric. Repairs are made by releasing the tension on the belt and lacing in new belting to replace a damaged portion.

Operation at Spoil Bank—At the delivery end of the main belt line an arrangement has been developed which permits uninterrupted delivery as the discharge end is moved along the face of the dump or extended outward as the fill advances. This is accomplished by

FROM WEST COFFERDAM along Columbia River belt conveyor line for spoil removal extends up side of bank to Rattlesnake Canyon dump. In center foreground barge is driving piles to support conveyor bridge to carry to dump material excavated from east abutment area directly opposite west cofferdam.

three units: An extensible conveyor, a telescoping conveyor and a cantilever boom conveyor. The extensible conveyor, which takes delivery from the last of the standard units on the main line, readily can be extended in length 49 ft. at a time until it reaches a total length of about 300 ft., at which time a complete new drive unit is substituted and the extensible conveyor is retracted and moved ahead.

The extensible conveyor delivers to a telescoping unit which has a 49-ft. movement. This unit makes such gradual advance as is required up to the 49-ft. limit (when a new unit is added to the extensible conveyor) and delivers to the 175-ft. boom conveyor. The original boom length was 150 ft., but as this brought the tractor so close to the edge that it was endangered by slides a longer boom was substituted. The boom conveyor is supported at its loading end on a turntable and its midpoint is carried on a tractor set radially to the axis of the conveyor. The tractor can move the boom gradually back and forth through a 180-deg. arc so that its discharge end swings along the face of the dump while movement of the telescope section can advance it gradually 49 ft. A short stop then is necessary to increase the length of the extensible section. A universal mounting over the tractor enables it to be turned to any angle with the conveyor axis.

With this arrangement the stacker belt can be swung and advanced without interrupting delivery. Both radial and forward speeds are 10 ft. per minute, controlled from the operator's station on the boom above the tractor. At this point is located a master control for the main conveyor system as a whole.

The angle of repose of material on the dump remains at 45 deg. for only a short time. The dump slowly but continually slides forward in front of the discharge point of the stacker and

FEEDER UNITS of belt conveyor system within west cofferdam receiving spoil from motor trucks loaded by power shovel. Feeder in upper left corner is delivering to hub discharging on to main belt line.

THIS WAY OUT. Spoil from west cofferdam area is loaded by feeders converging upon hub (in upper left corner) serving main line belt which operates under protective roofing.

takes a very flat angle. In fact, the material does not seem to come to rest; the toe of the dump is continually moving up the canyon, away from the stacker belt, at the rate of about 5 ft. per day. At present the dump under the boom is 230 ft. deep and the toe of the slope to which continuous movement extends is 1,020 ft. ahead—an average angle of five to one.

This extremely flat slope was unexpected and has attracted much attention. Late in June the stacker had been in the same location for five weeks; the material continuously had broken at the shear line under the boom end. The added load, as material continues discharging over the boom, seems to cause this extreme forward movement of the dump.

Slides in the face of the dump endanger the equipment assembled on the fill. To increase the capacity in the fill area the surface of the dump is maintained on an upgrade of 7½ per cent. The surface is smoothed up by a bulldozer supplied with additional material, when needed, by a plow slung above the stacker belt. The plow is dropped down so as to crowd material off the belt at a point where it can be reached conveniently by the bulldozer.

Personnel—The Grand Coulee project is being constructed for the U. S. Bureau of Reclamation—Dr. Elwood Mead, commissioner, R. F. Walter, chief engineer, and F. A. Banks, project engineer—under a general contract held by the Mason-Walsh-Atkinson-Kier Co., for whom H. L. Myer is general manager, Francis Donaldson chief engineer and M. H. Slocum general superintendent.

The belt conveyor was supplied by the Jeffrey Manufacturing Co., for whom Stanley M. Mercier assisted by R. M. Matthews supervised installation and directed the service rendered on the job.

Proof of LOWEST FINAL

MODEL "L-O"... 12.6¢ AN HOUR A Texas county commissioner reports that their 79 H.P. Model "L-O", pulling a 14-foot blade grader, uses only 2.8 gallons of Diesel fuel per hour, at 4.5 cents per gallon.

"K-O" SAVED 85% ON FUEL Near Phoenix, Ariz., two Model "K-O" Oil Tractors operated at a fuel cost of 90 cents each per day ... compared to a $12.00 fuel cost for two 60 H.P. tractors on the same job.

25% MORE YARDAGE...10% LESS FUEL On U.S. Highway 12 in Michigan, a Model "L-O" Oil Tractor moved 100 yards of dirt per hour ... handling a 12-yard scraper. Diesel fuel used ... 4½ gallons per hour. Nearby, a Diesel tractor moved 80 yards per hour with the same type of scraper, on a shorter haul ... using 5 gallons of fuel per hour.

• • •

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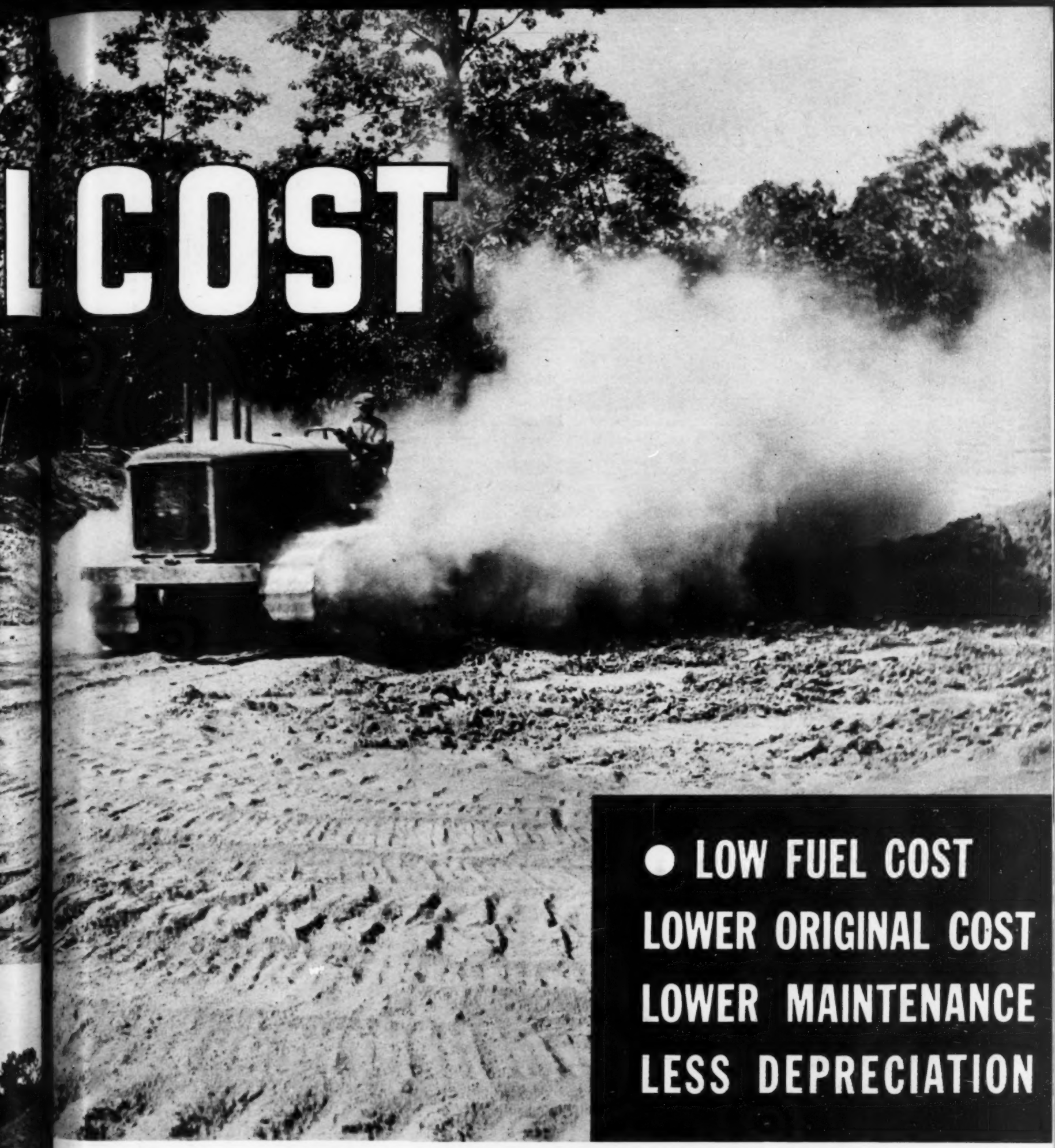
In fuel costs ... and all other costs ... Allis-Chalmers Oil Tractors are setting new lows on job after job. Not just low fuel cost PER HOUR ... but low fuel cost PER UNIT OF WORK DONE ... and LOWEST FINAL COST per yard of dirt moved. These results offer positive proof that the "low compression" principle of A-C Oil Engines reduces tractor costs.



- LOW FUEL COST
- LOWER ORIGINAL COST
- LOWER MAINTENANCE
- LESS DEPRECIATION

ALLIS-CHALMERS OIL TRACTORS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

Getting Down to
DETAILS

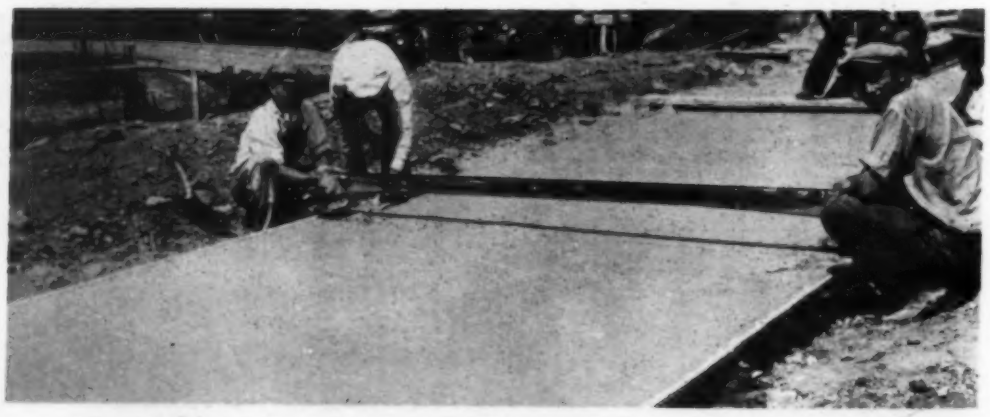
[Close-up Shots of Job Methods and Equipment]

TRAVELING TRIPPER on Jeffrey 3-ft. wide belt conveyor 604 ft. long, carried by trestle 65½ ft. high, distributes to stock piles sand and gravel aggregate for concrete for lining diversion tunnels and forming gate and outlet structures at Fort Peck dam on Missouri River in Montana. Other belt conveyors in two tunnels under stock pile retrieve aggregate for delivery to concrete mixing plant of Mason-Walsh Co., contractor for diversion tunnels serving 100,000,000-cu. yd. earth dam.

CONTINUOUS GIRDER BRIDGE ON CURVE, 555 ft. long, carries San Francisco-Eureka state highway across Eel River in California on 75-ft. high piers. Four straight steel girder spans of 120 and 100 ft. are joined at angle, while concrete deck slab is curved and overhangs girders. Design by H. D. Stover and A. B. Willett of the California Division of Highways.

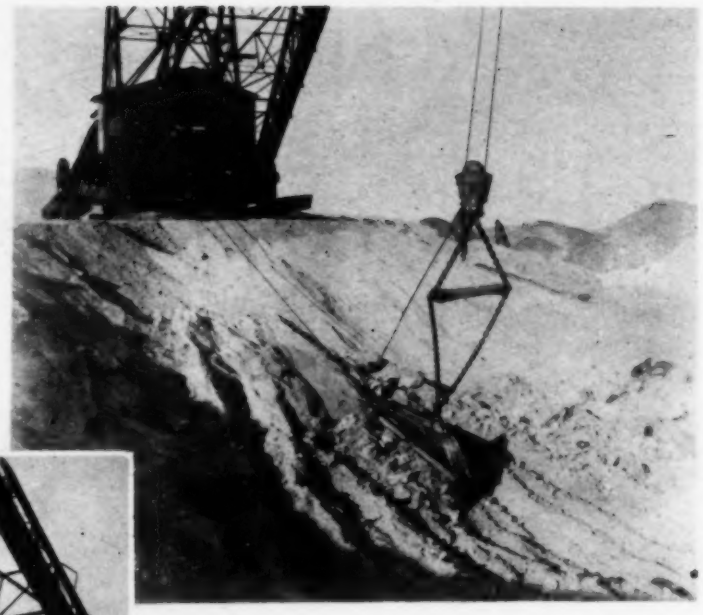
DETACHABLE STEEL BRACKETS, cantilevered from pairs of vertical channels anchored to steel frame, support bricklayers' scaffold platforms used in erecting walls of new buildings for $20,000,000 strip mill at Lackawanna plant of Bethlehem Steel Co., Lackawanna, N.Y. Hoist line reeved through single-sheave block attached to roof truss lifts wheelbarrow loads of brick and mortar to scaffold runways.

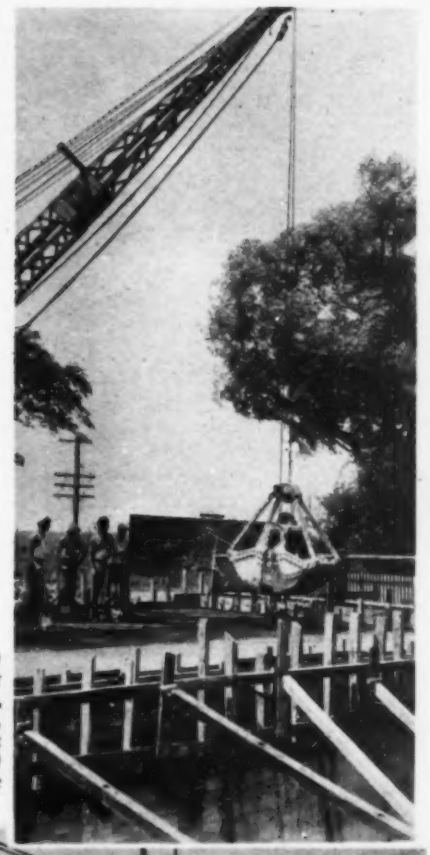
"FISHING" TOOL *(left)*, consisting of steel shaft with pronged end, removes from test pits sunk on U. S. Bureau of Reclamation projects, rocks too large to be handled by earth auger.



CONTRACTION JOINT in West Virginia concrete pavement midway between expansion joints (about 93 ft. apart) is formed by driving into concrete steel blade ⅛ in. thick and one-half depth of slab. Blade is driven immediately after completion of mechanical finishing operation. Joint later is closed with bituminous filler. W. A. Wilson & Sons, St. Mary's, W. Va., contractor.

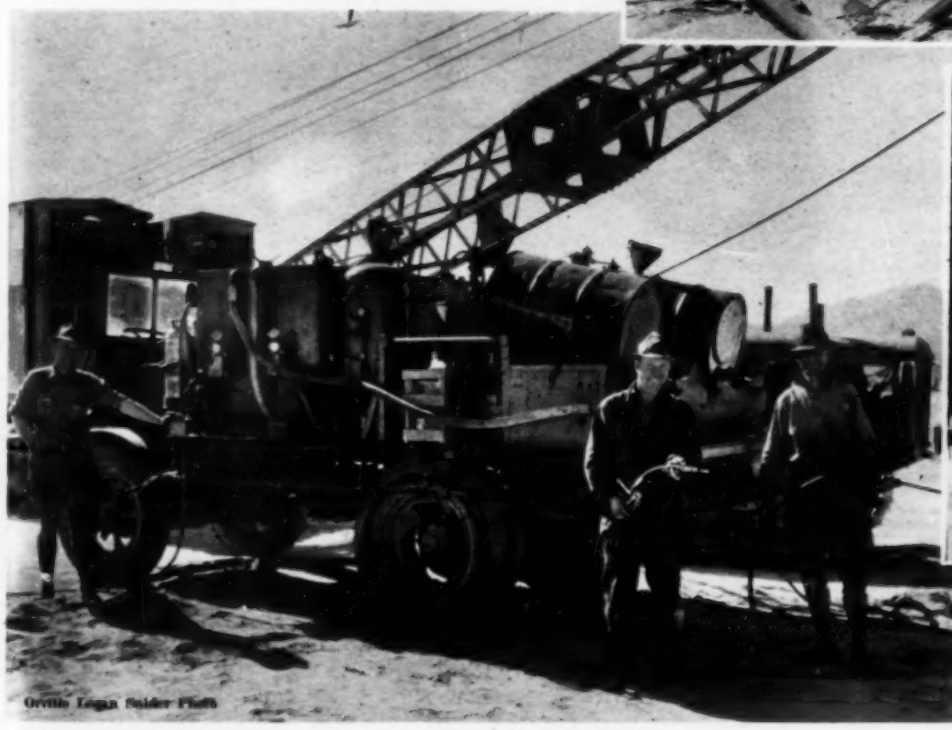
TEN-TON FISHHOOK, *(below and right)* designed by Major L. D. Crawford, of W. E. Callahan Construction Co., of St. Louis, Mo., and rigged on 165-ft. boom of Bucyrus-Monighan dragline, rips up cemented gravel as preliminary to excavation of section of All-American Canal in California, being built under direction of U. S. Bureau of Reclamation. Huge hook 27 ft. long, replacing dragline bucket, is dropped point first into gravel and pulled in by drag rope to eliminate necessity of blasting. Main members of hook are cut from 1¼-in. plates.

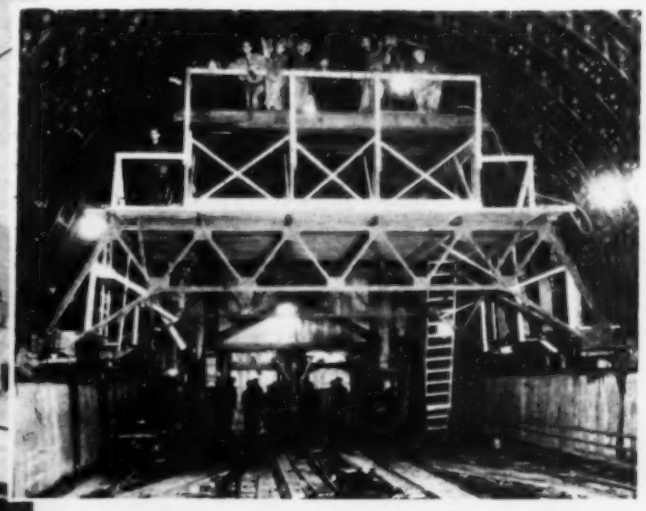




CLAMSHELL BUCKET *(below and right)* places concrete in two bridges for Rochester Concrete Construction Co., Inc., of Rochester, N. Y., on state highways near Canandaigua, N. Y., Bucket of 1-yd. capacity picks up about ½ yd. at a time from plank-lined pit *(below)* in front of 27-E paver and deposits concrete in bridge forms *(right)*.

MOBILE SERVICE STATION *(below)* reduces loss of working time and repair bills for heavy equipment of Wood & Bevanda, contractors of Stockton, Calif., on $1,300,000 contract for portion of Colorado River aqueduct. Upon an old Autocar truck chassis Leonard Zimmerman *(standing at left)* master mechanic, installed air compressors for high-pressure and low-pressure greasing, a 110-v. electric light generating unit, fire extinguisher, barrels of lubricating oil and grease, 280 gal. of gasoline, 150 gal. of diesel fuel oil, 100 gal. of water and complete high-pressure grease-gun equipment.





TRAVELING GANTRY PLATFORM mounted on wheels running along rails on concrete sidewalls, makes accessible for bolt-tightening and calking operations all points of cast-iron roof lining, 33 ft. in inside diameter, of double-track shield-driven tunnel by Arundel Corp., to provide new eastern entrance for Pennsylvania Railroad to station at Baltimore, Md.

TANDEM PAVERS

Place 66 Batches an Hour

1 FORM SUBGRADER digs trench to exact depth for forms.

BY OPERATING tandem 27-E pavers at close to 100 per cent efficiency, Hartmann-Clark Bros. Co., paving contractor, of Peoria, Ill., several years ago laid 6,156 sq.yd. of 18-ft. 9-6-9-in. concrete pavement in 13½ hr., with a single crew. On three consecutive days the paving crew laid a total of 15,518 sq.yd., or 1.47 mi., working a total of 37½ hr. and employing 88 men. A year later the same outfit built 15.58 mi. of concrete pavement in southern Illinois. Although rainy weather and unfavorable subgrade prevented making a new daily record, 5,600 sq.yd. of 18-ft. pavement was mixed, placed and finished in one 12-hr. day, and 4,660 sq.yd. of 20-ft. 9-7-9-in. slab was laid in another 12-hr. day. The 18-ft. slab required 1857.-77 cu.yd. per mile, and the 20-ft. slab, 1 in. thicker in the central portion and uniformly 9 in. thick for a foot of width along each edge, required 2411.-85 cu.yd. per mile.

Dry materials were dumped into the skip of the first mixer and lifted to the drum, where all of the mixing water was added. With a specified mixing time of 60 sec., the mixing period in the first drum was 32 sec., after which the partly mixed concrete was discharged into the second mixer skip and raised to the second drum, where it was turned for 29 sec., making a total mixing time, on this job, of 61 sec.

Time studies of the U. S. Bureau of Public Roads have established 75 sec. as the shortest possible batch cycle for a single mixer operating under a 60-sec. mixing specification. This cycle means that, for 100 per cent efficiency, the time consumed in charging and discharging must not exceed 15 sec.

2 FORM SETTERS tamp earth under forms to assure firm foundation.

Under normal conditions the second mixer of the tandem outfit turned out a batch every 44 sec. Only 15 sec. was consumed in charging and discharging, and 100 per cent efficiency was attained. This cycle was obtained not just occasionally, but batch after batch and hour after hour. It explains the record yardages laid.

A normal mixing cycle for the tandem mixers is indicated by the table.

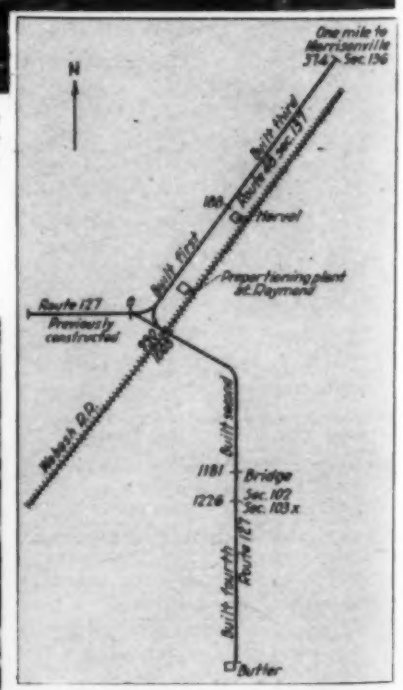
The second mixer required a little less time for charging because the partly mixed concrete slipped from the skip more quickly than dry materials. In spite of this shorter charging and shorter mixing time for the second mixer, the time from bell to bell was the same for both mixers. This timing was obviously correct, as neither mixer could get ahead of the other. The extra time was consumed in handling the discharge bucket.

Special provisions were necessary for getting mixing water into the drum, because a full batch of water was required every 30 sec. Two CH&E Triplex No 11 pumps were kept in operation, one at each end of the water line. At a midway point of long pipe lines the contractor built a sump to which water was pumped before being pumped on again to the mixer.

Near the pumps the pipe size was 2½ in.; near the mixer, 2 in. The pumps were capable of supplying 160 gal. per minute, and this quantity was

3 SUBGRADE PLANER, pushed by leading mixer, helps to eliminate delays caused by high or low subgrade.

4 TWO MIXERS are hitched in tandem. First mixes batch for 32 sec., second for 29 sec., increasing production 70 per cent above single-mixer maximum.



LOCATION PLAN. Pavement near batching plant is placed first to permit hauling over concrete.

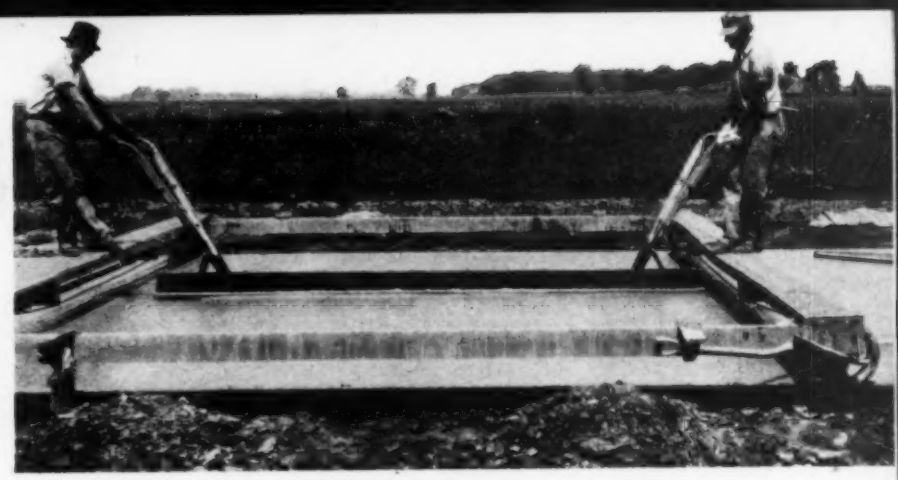
TANDEM-PAVER MIXING CYCLE
AVERAGE TIME REQUIRED IN SECONDS

Charging	Mixing	Discharging	Total time from Bell to Bell.
	First Mixer		
11.3	32.3	10.2	44.0
	Second Mixer		
9.6	29.0	10.2	44.0

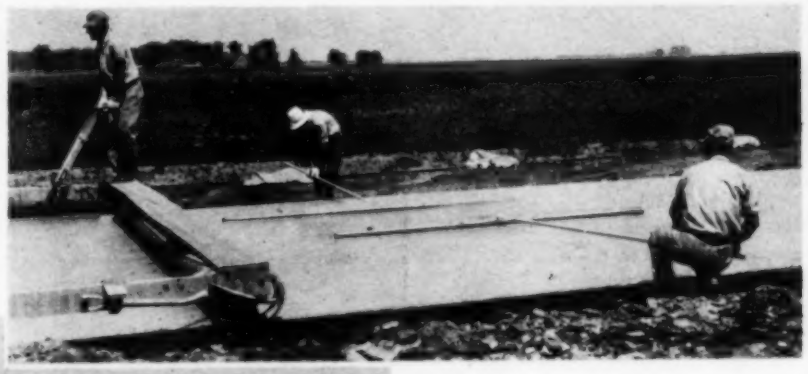
frequently needed when the mixers were running and ½ mi. of burlap was being sprinkled. After the first 24 hr. the pavement was given a surface application of calcium chloride.

Cement was handled by a subcontractor. A split-sack batch of 6 sacks and 38 lb. was used, producing 29.7 cu.ft. of mixed concrete. Two men weighed out and loaded the partial sack of cement.

When pavement moves forward at the rate of ½ mi. a day, preparation of subgrade becomes a real problem.



5 LONGITUDINAL FLOAT *(right)*, following finishing machine, wipes out all transverse ridges.



6 TWO STRAIGHT-EDGES behind longitudinal float scrape excess moisture and laitance from surface.

Brooming of the surface was specified. The brooms followed a one-man belting device that ran on the forms. One man broomed from each side of the slab, and, unless each began at the exact center, a ragged- looking junction line resulted. To avoid this ragged junction, a short piece of fish line was dragged by the belting machine, making a line along the center just deep enough to guide the broomers.

Thirty-five carloads of gravel and sand and five carloads of cement were required per day to feed the tandem mixers. Although only a moderate amount of aggregate was kept in storage piles, not a moment's delay occurred for lack of materials, nor was a dollar paid for demurrage.

As the entire road was concreted from one set-up of the proportioning plant, at almost the exact center of the job, the longest haul was 8 mi. Fifty two-batch trucks were required on the longest haul. Hauling was sublet to a subcontractor on a batch-mile basis.

Exclusive of truck drivers, the entire crew consisted of 75 men. The tandem mixers increased production from a single-paver maximum of a batch every 75 sec. to a batch every 44 sec. or an increase of 70 per cent. This increase was accomplished by adding a mixer, a pump, an unloading crane, 1 mi. of forms and about 10 men to the regular equipment for a single mixer job.

Equipment used on tandem-mixer paving job: 1 Koehring industrial crane, 1-yd. bucket; 1 Koehring industrial crane, 1¼-yd. bucket; 1 Blaw-Knox 70-ton two-compartment bin; 2 small blade graders; 1 Caterpillar 30-hp. tractor; 1 Caterpillar 35-hp. tractor; 2 "Tumblebugs" (automatic fresnos); 1 Carr form trencher; 2 mi. steel forms; 1 Lakewood subgrader; 1 Carr subgrade planer attached to mixer; 1 Koehring subgrade planer attached to mixer; 2 27-E Koehring mixers; 1 Ord finisher; 2 International 1½-ton service trucks; 2 Triplex C-H&E No. 11 pumps, and 30-50 Trucks (Property of hauling contractor).

7 ONE-MAN BELTING MACHINE completes third finishing operation.

A trench first was dug for the forms with a Carr form grader, operated by one man. After the forms were set, excess earth was removed by two 30-hp. tractors, each pulling an automatic fresno. The fresnos were preceded by blade graders which shaved off high spots, if there were much to be removed. A subgrader, resting on the forms, followed the fresnos. Excess earth was shoveled on to the shoulders by hand.

Illinois specifications require a subgrade planer between the mixer and the concrete. This planer was used as the final subgrade check and to remove any high spots. Hartmann-Clark Bros. also placed such a device ahead of the leading mixer to avoid all delays in mixer operation caused by unprepared subgrade.

8 PAVEMENT THICKNESS is checked by taking subgrade elevations ahead of mixer and pavement elevations, at same points, after final belting.

9 BROOMING *(below)* is last finishing operation. Two broomers work from light center-line mark toward opposite edges of pavement.

10 24 HR. OF WET BURLAP CURING *(below)* precedes surface application of calcium chloride.

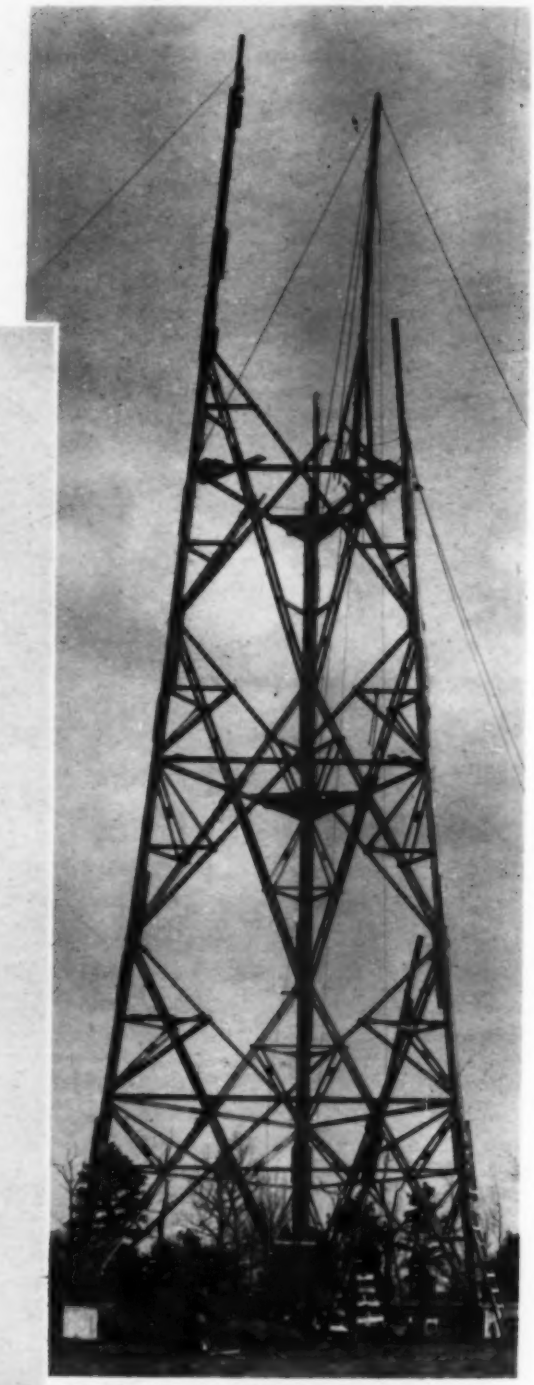
TIMBER CONNECTORS

Hold 320-Ft. Radio Tower

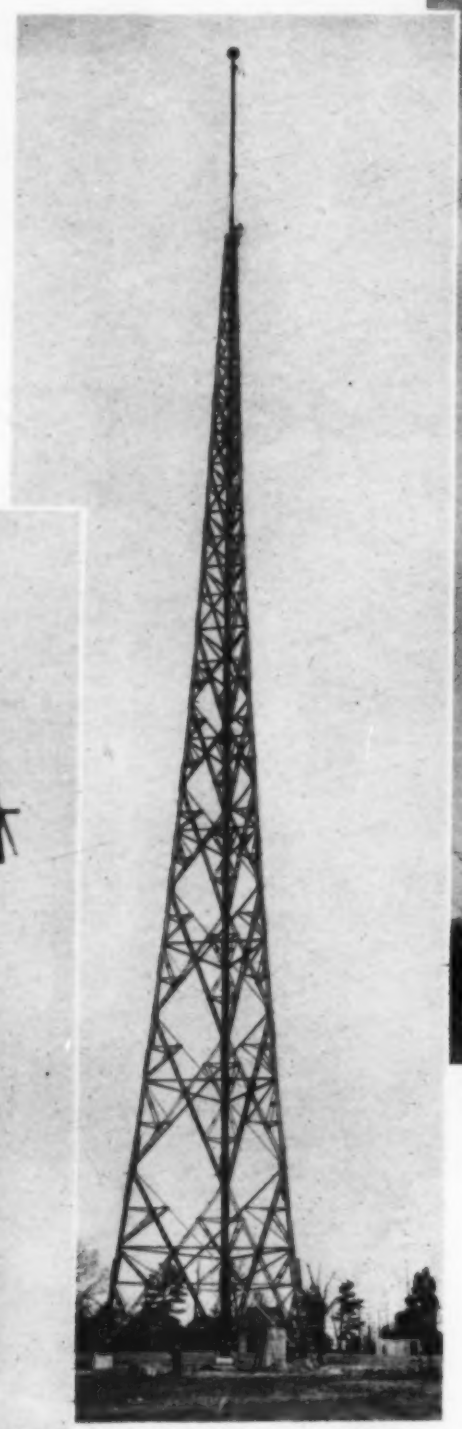
RISING to a height of 320 ft., tallest self-supporting timber structure in the Western hemisphere, the all-wood triangular radio tower of broadcasting station WRVA, completed this spring at Richmond, Va., was made possible by a design substituting for the conventional bolted joints of the structure modern timber connectors of the metal ring and disk types, recently introduced into this country from Europe by the Forest Products Division of the Department of Commerce. With the improved connectors it is possible to utilize from 80 to 100 per cent of the allowable working stress of the wooden structural members as compared with only 50 to 60 per cent with the old-fashioned cumbersome bolted connections. Also, because of its insulating properties, wood for a radio station tower is claimed to offer advantages as a means of support for a broadcasting antenna.

As designed by Frank P. Cartwright, engineer of the National Lumber Manufacturers' Association, the wood tower is triangular in plan tapering from a base width of 38½ ft. between concrete piers to 15 in. at the top. This tripod shape was adopted in preference to a four-legged tower to minimize wind resistance and reduce the required amount of lumber. The three independent and identical faces of the structure extend upward 280 ft. whence a 40-ft. mast raises the height to a total of 320 ft. The lumber used was longleaf yellow pine in maximum lengths of 24 ft., surfaced on four sides to facilitate precise fitting; allowable working stresses were 2,100 lb. per square inch in compression and 2,400 lb. per square inch in tension. At their corners the three faces of the tower are connected by hexagonal spacer pieces to which they are respectively attached with split ring connectors. The split ring connector used at the joints is a smooth ring of steel, with a tongue-and-groove break. It is seated in a circular groove, half the depth of the ring cut around each bolt hole in the overlapping wood members to be joined by tightening up on the bolt. The connector carries all of the load as the bolt merely holds the members together.

Detailed drawings were prepared for each wood member of the tower and each piece was accurately cut, bored or grooved in the field with a portable drill to facilitate rapid assembly with the modern connectors which were supplied by the Timber Engineering Co. Erection was handled by the Wise Granite & Construction Co., of Richmond, with a crew of regular structural steel workers, under the supervision of Lee Paschall. A gin pole resting upon convenient horizontal members of the structure was employed for placing the lower portion of the tower. Upper panels were erected by a traveler rigged on the outer leg faces at one corner. The final operation consisted of hoisting the topmast up through the center of the triangular structure and attaching it to the inside faces of the corner legs by means of connectors engaging grooves cut in the mast.

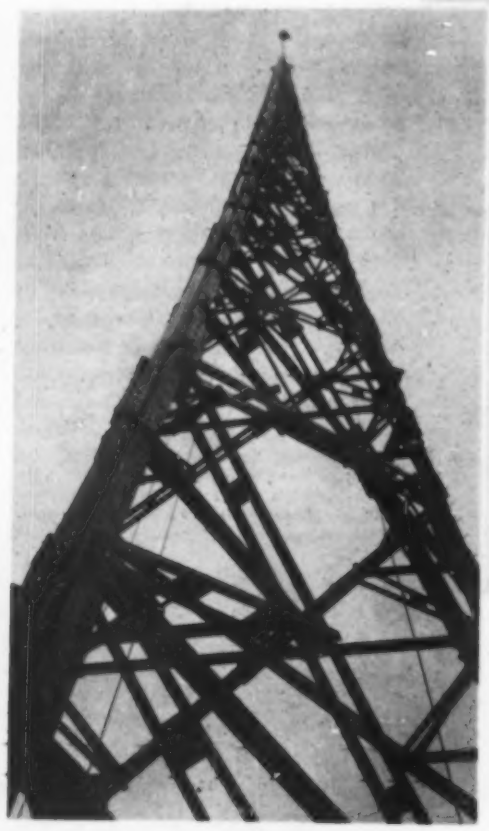


ERECTION OF TOWER is handled by gin pole for lower stages and by traveler attached to outer face of leg for upper portion.



HEIGHT of 320-ft. is reached by top of 40-ft. mast extending up through top of 280-ft. all-wood tower.

WOOD MAST, 40-ft. high, is hoisted to place through center of triangular framed structure.



FACES of triangular all-wood tower *(below)*, joined at edges of legs, are separate but identical in design.

COULEE DAM *(right)*. No, we haven't used the wrong caption for this photograph. This *is* Coulee Dam, two-year-old chestnut thoroughbred owned by Mrs. Silas B. Mason, of New York, who is standing at the colt's head. As the wife of the well-known contractor whose firm is building the Grand Coulee dam on the Columbia River in Washington, Mrs. Mason decided to name her horse for the big construction project upon which her husband is engaged. The choice has been a fortunate one as Coulee Dam, after his first start at Havre de Grace, has carried the Mason colors to victory in three races at the Belmont track in New York this summer. Contractor Silas B. Mason is viewing the proceedings from the extreme right.

JOB ODDITIES

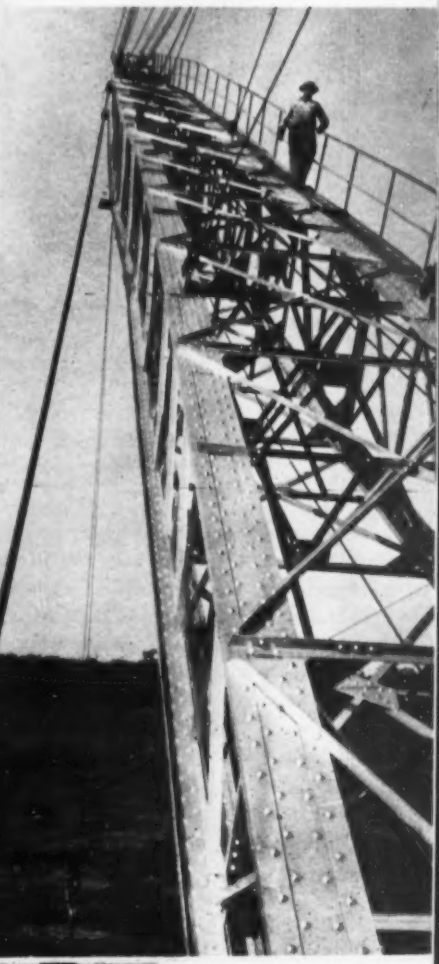
A Monthly Page of

Unusual Features of Construction

Fairchild Aerial Surveys Photo

BOULDER LAKE, as seen through special ten-iens camera covering area of 200 sq.mi. from altitude of 20,000 ft. above canyon of Colorado River. To aid topographic map making for Soil Erosion Service of Department of Agriculture by defining contours of terrain aerial photographs are being taken each time water level in reservoir behind Boulder dam rises 20 ft. Boulder Dam, ordinarily the dominant feature of any picture in which it is included, appears as tiny, unobtrusive white crescent indicated by arrow at bottom of photograph.

LONG BUT LIGHT. *(below)* This 175-ft. boom of Alcoa aluminum alloy on levee-building dragline of McWilliams Dredging Co., of Louisiana, weighs, fully rigged, 29,000 lb. or 17,000 lb. less than a standard 150-ft. steel boom.



TOPPLED BY MELTING. *(above)* In dismantling steel towers of Sky Ride at Chicago's Century of Progress grounds two of four legs were melted by thermite applied in pairs of cupolas built around steel legs to produce 5,500-deg. temperature.

CONVEYOR FLIES TO JOB *(left)*. Sectional construction of Barber-Greene 42-ft. belt unit, weighing 4,000 lb., permits of crating in 10-ft. long bundle for shipment by air to Bulolo Gold Dredging Co. project in New Guinea, difficult of access except by air route.

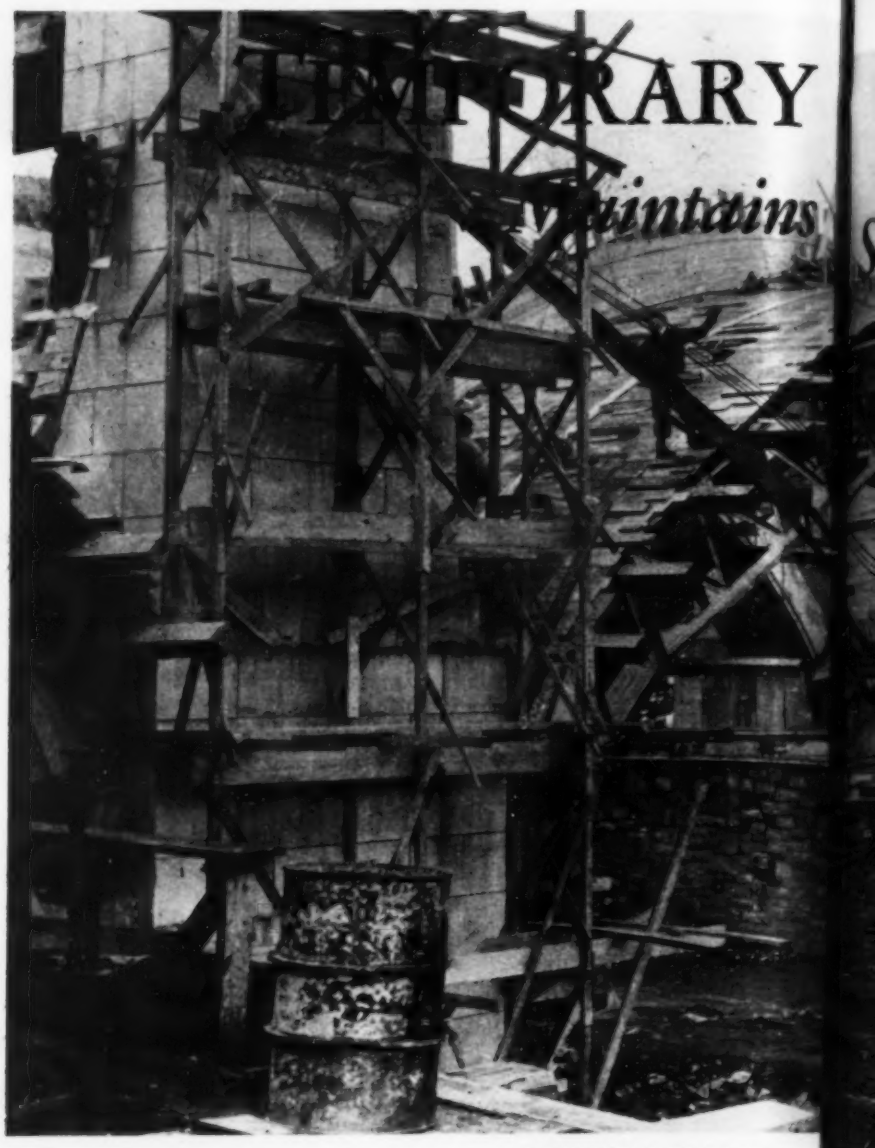
DURING the interval between the razing of an old deck-truss steel bridge which carried P Street across Rock Creek and the completion of a new two-span, three-rib concrete arch structure at the same site, in Washington, D. C., the Pecora-Gaskill Engineering & Contracting Corp., of Baltimore, maintained street-car traffic on the P Street line by passing all cars over a temporary single-track steel trestle erected at a distance of 64 ft., c. to c., from the bridge. Vehicular and pedestrian traffic was detoured to the nearby Q Street Bridge. After putting the temporary trestle into service, the contractor dismantled the old steel span, measuring 109½ ft., c. to c. of pins, and began difficult excavating operations involving the demolition of 8,000 cu.yd of stone masonry in the two abutments of the old bridge.

Steel - Railway Trestle — To carry street-car traffic during the construction period, the engineers of the District of Columbia Bridge Department designed a steel viaduct more than 300 ft. long and about 55 ft. high. The deck stringers of this structure were supported by two steel bents and two steel towers, with wood cribs at each end under the approach stringers. Each leg of the supporting steelwork rested on a concrete pedestal which was carried down to a sound foundation. Bethlehem Fabricators, Inc., of Bethlehem, Pa., supplied and erected the viaduct steel. The street railway company laid the cross-ties and rails for the track. After completion of the viaduct, it was found advisable to stiffen one of the bents by the addition of concrete incasement.

Excavation—Total excavation for the two abutments and center pier of the new concrete bridge amounted to 15,000 yd., of which about half was in the old stone masonry abutments. Drilling and blasting were necessary to break up this masonry for loading by shovel or crane. Two Ingersoll-Rand portable compressors supplied air for four Cleveland manually operated rock drills, Timken detachable bits were used in drilling. Blasting operations required more than 1,000 lb. of duPont 40 per cent gelatin dynamite.

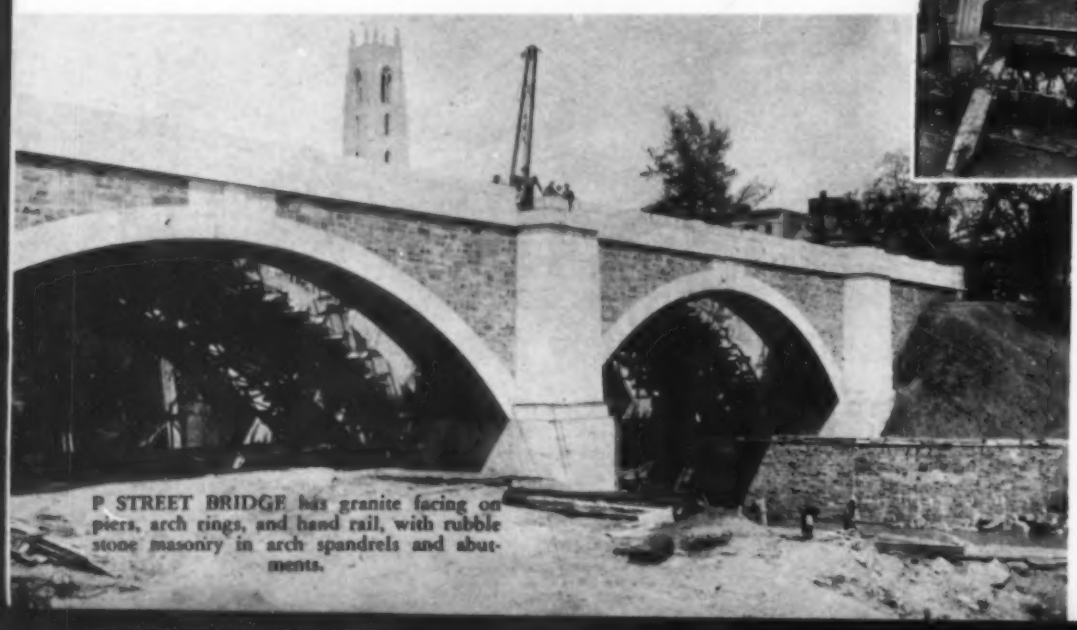
Footing grades were adjusted to assure sound foundation material and freedom from danger of undermining by Rock Creek. The bottom of the footings at the west abutment is El. 10, and the footing grade at the east abutment is El. -6. Individual foundations to support the three ribs of each arch are called for by the design. At each abutment and at the center pier the footings for outside ribs are 18 ft. wide and the footing under the middle rib is 21 ft. wide. The length of these footings, measured in the direction of the

TEMPORARY STEEL TRESTLE carries street cars across ravine during construction of new bridge. CONCRETE INCASEMENT *(at right)* stiffens tall center bent of steel trestle.



THREE-RIB CONCRETE ARCH BRIDGE comprising two 110-ft. spans carries P Street, in Washington, D.C., across Rock Creek.

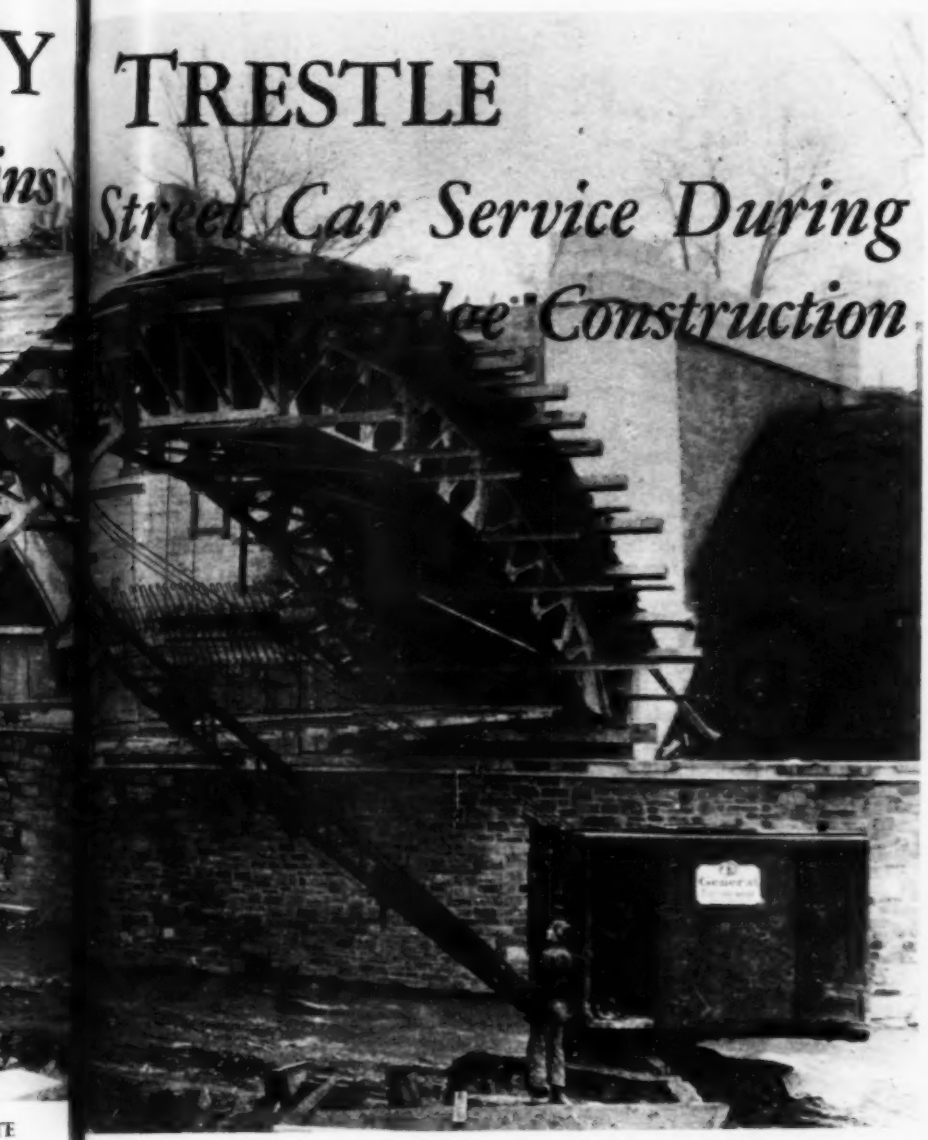
BRIDGE BUILDERS. *(Left to right, below)* H. T. Massey, superintendent for Pecora-Gaskill Engineering & Contracting Corp.; N. G. Tayman, assistant resident engineer, and W. A. Draper, resident engineer, for District of Columbia.



P STREET BRIDGE has granite facing on piers, arch rings, and hand rail, with rubble stone masonry in arch spandrels and abutments.

TRESTLE

Street Car Service During ... Construction



bridge, is 35 ft. at the two abutments and 17 ft. at the center pier.

As the west abutment was excavated on high ground, no cofferdam was required at this site. For the center pier and for the east abutment, the contractor built earth dikes and bypassed the stream around the site of the excavation. A Byers crane and a Northwest power shovel, operating on the dike or within the protected area, built up the cofferdam and loaded spoil into trucks for removal from the bridge site.

Concreting Set-Up—A Rex 27-E paving mixer at the west abutment and a Rex 21-E paver at the east abutment produced most of 8,700 cu.yd. of concrete required for the new bridge. Batch trucks delivered weighed materials which they picked up at two commercial plants, one plant supplying bulk cement and the other sand and gravel. Concreting operations started at the west abutment, where the 27-E mixer was placed on top of the bank, whence concrete could be delivered by chutes into the forms. This abutment required almost 2,500 cu.yd. of concrete.

Each of the two concrete arches has a clear span of 94 ft. 10 in. and a total length, c. to c. of piers, of 110 ft. Outside ribs are 9 ft. wide and the middle rib is 21 ft. wide. The thickness of all ribs, measured radially, averages about 4½ ft. At all piers the grade of the arch springing line is 30 ft. 4 in. above mean low water, and the grade of the bridge deck is El. 55.

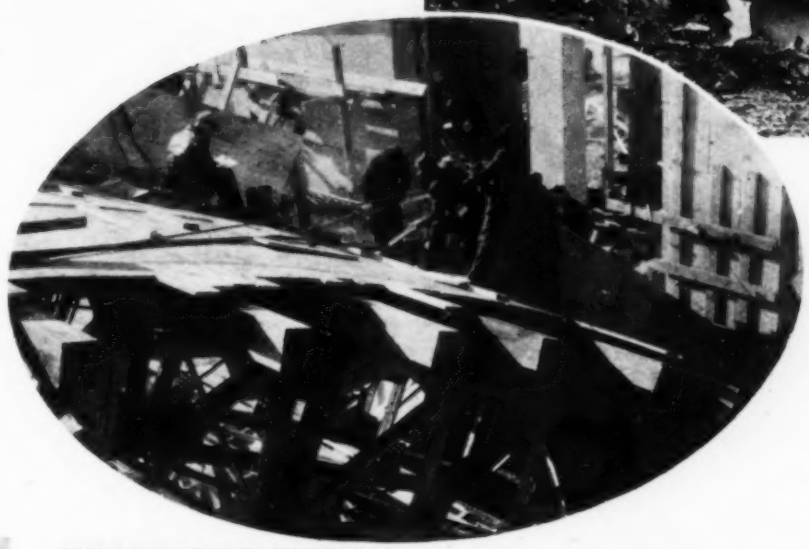
Two sets of Blaw-Knox steel centers, adjustable for concreting either two 9-ft. ribs or two 21-ft. ribs simultaneously, thus keeping a balanced load on the center pier, supported the arches during construction. These centers were moved across the bridge from one 9-ft. rib to the other, the 21-ft. center rib being built last. The soffits of the arch forms were lined with Presdwood to provide a smooth, watertight form surface.

Footing and pier forms were built with 1x8-in. lumber and were tied with Universal strap ties spaced 2 ft. apart horizontally. The vertical spacing depended upon the depth of the form. Starting with the first strap tie 6 in. above the bottom of the form, the next two rows of ties were spaced 12 in. apart, the fourth row was placed 18 in. higher than the third row, and the rest of the rows were spaced 24 in. apart.

Stone Facing—A facing of granite from Stone Mountain, Ga., is provided by the design. This granite was placed by Louis Perna & Son, subcontractors, of Washington, D.C. At the abutments and center pier, the stone contractor operated a Bay City truck crane to advantage in placing the stone.

Administration—Construction of the new P Street Bridge was carried out by the Board of Commissioners of the District of Columbia under the direct supervision of C. R. Whyte, engineer of bridges, W. A. Draper, resident engineer, and N. G. Tayman, assistant resident engineer. H. T. Massey, superintendent, was in charge of the work for the Pecora-Gaskill Engineering & Contracting Corp.

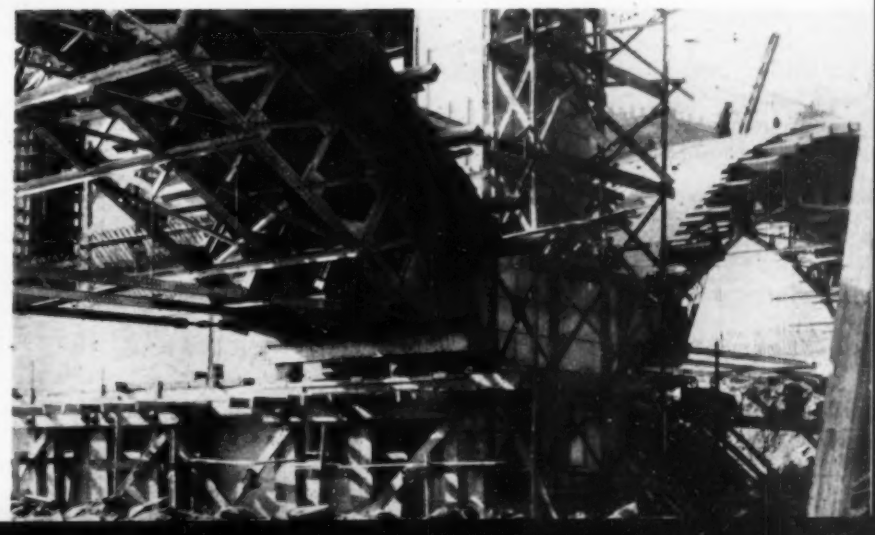
EARTH DIKE *(below)* diverts Rock Creek around excavation for east abutment. Two pumps lift water from sump at right. Plank roadway for trucks hauling spoil from shovel can be seen at rear of excavated area.



ENGINEERS CHECK SETTING of granite fascia ring in arch soffit prior to placing concrete.

SMALL, MOBILE CRANE *(left)* sets stone for subcontractor at west abutment.

STEEL ARCH CENTERS *(right)* rest on wedge jacks to facilitate lowering before moving on greased plates.



Enamel-Lined Welded Pipe

Carries New Water Supply to Hamilton, Ohio

By ALFRED Le FEBER,

Barstow & Le Feber, Inc., Consulting Engineers,

Akron, Ohio

AS PART of a well-rounded program for increasing and improving its water supply, the City of Hamilton, Ohio, during the last year completed almost 7 mi. of 24-in. supply mains. Part of the supply line consists of two parallel 24-in. mains connecting a new well field with the city's distribution system. The entire line is made up of spiral-welded plate pipe of open-hearth iron, with field-welded chill-ring joints between pipe lengths averaging 40 ft. long and with mechanical couplings at intervals of about 400 ft. to provide for expansion. Bitumastic inner lining and outer coating reduce friction in the pipe and protect it from corrosion.

PORTABLE WELDERS generate electricity for field-welding of joints.

MECHANICAL COUPLINGS *(left)*, installed at intervals on welded pipes, provide for expansion. Concrete buttresses will be constructed later at angle in mains.

FIELD WELDER *(right)* applies bead in down-handed position while pipe rotates on dollies.

Background of Project—After experiencing a shortage of water, the City of Hamilton, Ohio, engaged the writer's firm to make an investigation. A survey and report, completed in November, 1929, recommended a new well water supply, reinforcing mains and increased storage.

In October, 1933, funds for the project were allocated by PWA. The entire program was broken up into contracts covering similar types of work. In March, 1934, bids were received for the drilling of wells and the construction of nearly 7 mi. of 24-in. pipe line, joining the new supply with the new reservoir and distribution system. The well field and supply works are about 1 mi. from the nearest point in the distributing system.

Because of irregularities in bidding, the pipe line was readvertised in April, along with the distributing reservoir. Both contracts were awarded pending arrival of funds, the pipe line going to Walter S. Rae and A. W. Smith, based on their bid on plate pipe.

PIPE-HANDLING CRANES lay 1,000 ft. of 24-in. welded main.

Competitive Bids—Pipe-line bids had been invited on several competitive materials, including cast iron (both sand-cast and centrifugally cast), wrought iron and open-hearth iron. Fabricating specifications for the plate pipe permitted hammer-welded, electrically butt-welded and spiral-welded types. The successful bidder originally offered open-hearth-iron-plate pipe with electrically welded butt joints, but upon discovery of the difficulty of supplying truly circular pipe the contractor offered spiral-welded pipe of the same material as manufactured by the American Rolling Mills. This pipe is fabricated in random lengths, averaging approximately 40 ft. In view of the fact that the terrain receiving the pipe is practically level, these lengths were accepted.

Pipe-Lining—Upon completion of fabrication the lengths were tested to 400 lb. per square inch hydrostatic pressure. After the hydrostatic test the pipe was given a priming coat, both inside and outside, of bitumastic priming solution, followed by a coating of bitumastic enamel. A special device, constructed for lining and coating the pipe, consisted primarily of a motor, speed reducer, sprocket, chain drive and dolly idler. Hot bitumastic enamel for the lining was applied by means of hand-operated trucks carrying V-shaped troughs filled with hot enamel. These troughs were fed from each end of the revolving pipe, as shown in an accompanying photograph.

After the hot enamel had been discharged into the pipe, it was spun into place by centrifugal action and later was cooled. The resulting lining provided a hard, smooth surface. An outer

coating of bitumastic enamel was applied as shown in another photograph.

During the early stages of fabrication, atmospheric temperatures prevailing in southwestern Ohio were abnormally high. At one time a temperature of 124 deg. F., was observed, while pipe lying along the trench showed a temperature of 134 deg. To minimize the effect of a hot sun upon the coating, the pipe was whitewashed before leaving the shop. Little difficulty was experienced in handling the pipe, and a remarkably small amount of the outside coating showed abrasion. The pipe was transported by truck from the factory at Middletown, Ohio, to the site.

Pipe Laying—Various types of excavating machinery were employed, ranging from draglines to backhoes. The pipe was handled in the field by P&H pipe hustlers using canvas slings. Lengths handled by the pipe hustlers singly or jointly varied from 10 ft. to 1,000 ft.—that is, a single bell-hole joint was made for as little as 10 ft. or as much as 1,000 ft. The pipe was joined in the field with chill-ring welded joints and Dresser-coupling expansion joints.

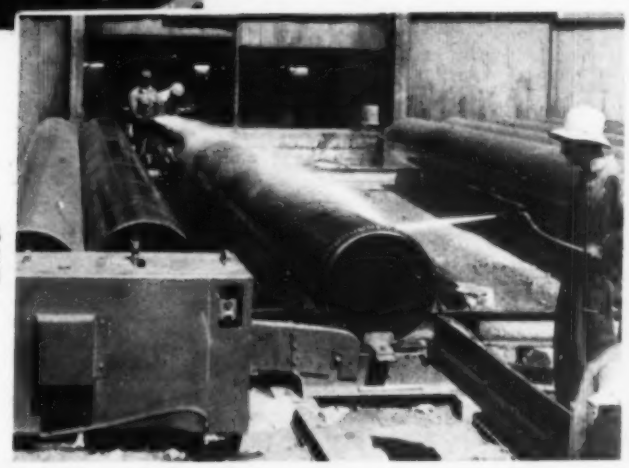
Welding Tests—Great difficulty was encountered in procuring skilled welders. It was determined to do the field welding in accordance with the requirements of high-pressure-vessel welding. To qualify as welders, applicants for both field welding of joints and fabrication of special fittings were required to make three passes around the pipe, employing a chill ring and single V-type joint. Several coupons from each applicant were tested and the fitness of the applicant thus determined. In addition, the automatic process for fabrication of the spiral-welded pipe was qualified, and later the portable generator sets used for field work also were tested and accepted. The greatest mortality of applicants was in the field welding group, where 70 per cent finally was accepted. Shielded arc welding was employed throughout.

POURING POT *(right)* **applies outside enamel coat while pipe rotates.**

In the automatic welding for fabricating the pipe an uncoated rod with a hand applied coat was employed, while in the fabrication of special fittings and in field welding heavy coated rods were used. Field joints were constructed by making two passes around the pipe, the first pass fusing the bead on the chill ring with the base of the V, forming the root weld. The second pass formed the bead.

Enamel lining and coating terminated 10 in. from the ends of the pipe to facilitate field jointing. Upon completion of the field weld the uncoated and unlined portions of the pipe were coated by hand, and inside inspection was made with the aid of a small rubber-tired truck. Air was supplied to workmen inside the pipe line by means of a blower.

Field Fabrication—In laying the pipe line, several (usually three) lengths were lined up along the side of the trench and arranged on dollies. Joints were first tack welded and the entire line checked for alignment. Then followed the welding of the joints, the welder being able to make these welds entirely in the down-hand-



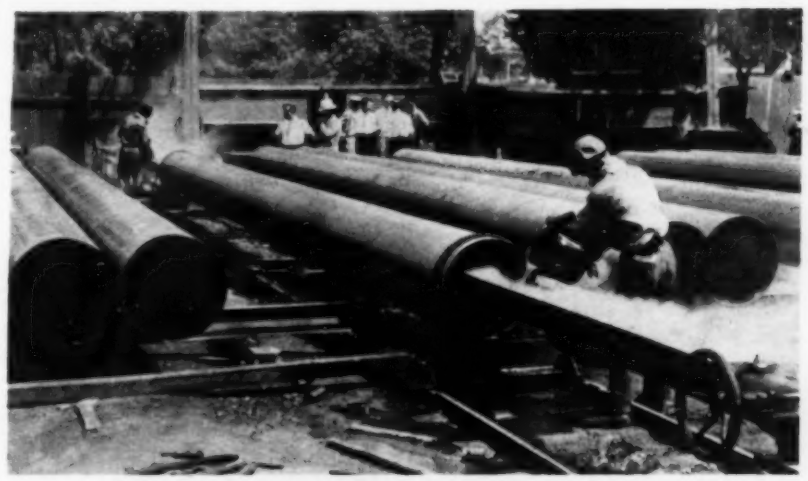
TWO STREAMS OF WATER *(right)* **cool enamel lining of pipe.**

ed position while the pipe was rotated slowly on the dollies. Bell-hole welders were special men qualified to weld not only in the flat but in the vertical and overhead positions as well.

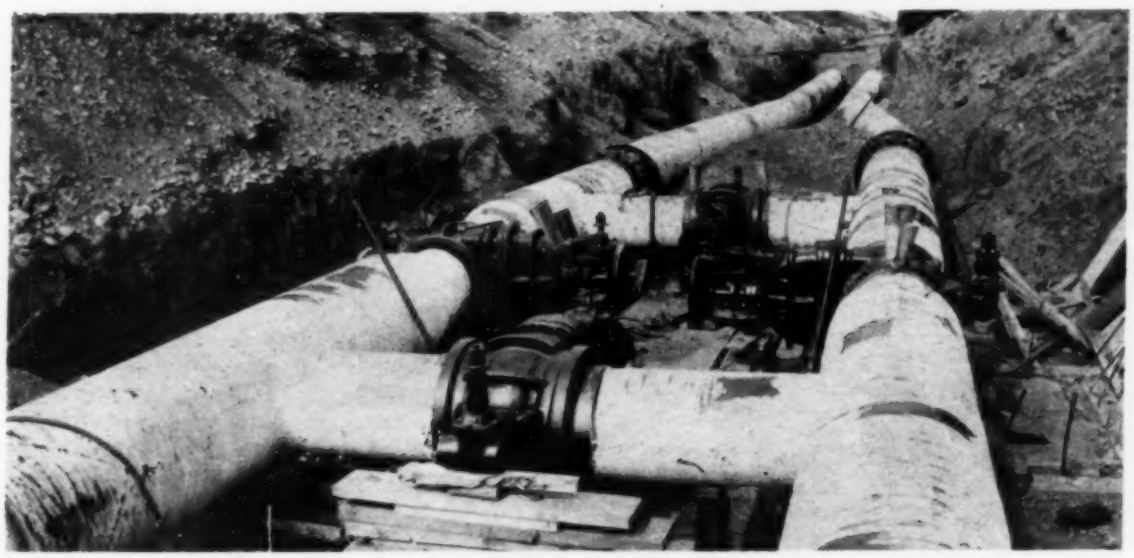
Certain portions of the pipe line traversed the industrial section of the city. Obstacles encountered along the line, in addition to water lines, sewer lines and gas lines, were large pipe tunnels, canals, hydraulic raceways and subterranean reservoirs. What otherwise would have been an extremely difficult job of fitting and connecting was made comparatively simple by the flexibility of plate pipe. Expansion joints were placed at intervals of about 400 ft.

Progress—The contract was signed April 30, 1934. Pipe lining started July 20, 1934, and the last field weld was completed on Feb. 11, 1935. The total number of field welds was 851, and the total number of expansion joints was 80. During the major portion of the work, the contractors employed two welding crews.

Negotiations and arrangements leading to construction of the project were carried out by R. P. Price, city manager of Hamilton, Ohio. The H. C. Nutting Co., of Cincinnati, made the tests and reports prerequisite to the qualifying both of fabricating processes and of welders. This firm also tested and inspected the materials used in the pipe line and maintained constant inspection of actual fabrication. L. F. Converse, resident engineer, and R. C. Sypherd, chief inspector, were in charge of field work, under the general supervision of the writer.



V-SHAPED TROUGHS mounted on hand-operated trucks at two ends of pipe are filled with hot enamel for inner lining.



CROSSS CONNECTIONS and valve chambers between two parallel 24-in. mains permit either pipe to be shut off without interrupting service.

"REVERSIBLE COFFERDAM" Serves Two Halves of Bridge Job

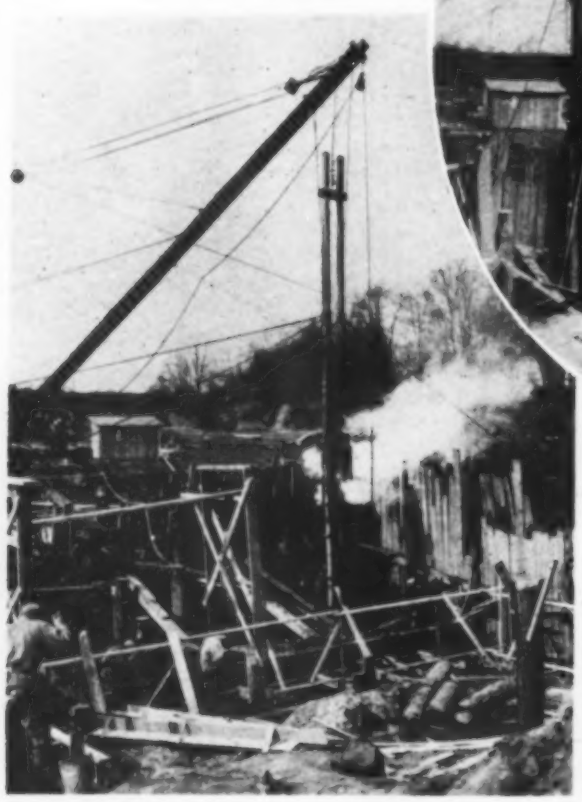
A COFFERDAM consisting of two lines of 2-in. oak sheeting spaced 6 ft. apart and filled with earth served in succession the two halves of a bridge job across Little Duck Creek, on Delaware's Coleman duPont dual highway, which Spear-Jones & Co., of Dover, Del., built under subcontract with D. E. O'Connell & Sons, Inc., of Wilmington, general contractor for the connecting roadway. In constructing the foundations for the two abutments and two piers of a three-span concrete-slab bridge at this site, Spear-Jones & Co. first inclosed the abutment and pier at the south end of the bridge with an earth-filled wood-sheet coffer having one wall parallel with the course of the stream and two wings connecting this wall with the bank. By reversing the two wings after these foundations had been completed, the contractor inclosed the north half of the job and bypassed the stream through the completed south portion. The cofferdam was built to withstand maximum heads of about 10½ ft. and a tidal range in the creek of about 4 ft.

Highway Bridge—Designed by the Delaware State Highway Department to carry the second roadway of the duPont dual highway, the bridge is a duplicate of the existing concrete structure across Little Duck Creek. The end spans are 17¼ ft. long, and the middle span is 18½ ft. Width of the bridge roadway is 41 ft. 10 in. although the connecting pavement being built under the general contract is only 20 ft. wide.

TRESTLE RUNWAY is constructed to transport total of 515 cu.yd. of concrete for bridge by buggies from single mixer set-up on north bank of creek.

M. A. SPEAR, of Spear-Jones & Co., is firm's office manager.

R. L. JONES, member of firm, directs construction work for contractor.



STEAM HAMMER *(left)* in guyed leads on derrick boom drives foundation piles for south pier inside earth-filled wood-sheet coffer. Note splined wood sheeting around south abutment footing.

A total of 132 timber piles 20 ft. long carry the two abutments and two piers of the bridge. These piles project 1 ft. into the concrete footings of the substructure. The bottoms of the abutment footings are 4¾ ft. below mean low water, and the grade of the pier footings is 6¼ ft. below mean low water.

Cofferdam Construction — Wood sheet walls of the earth-filled cofferdam were driven to about 6 ft. below low tide. After pumping out the first cofferdam (at the south end of the job), the contractor discovered springs in the bottom. Drains were laid to conduct the inflowing water to two sumps from which three pumps lifted the water over the side of the coffer. The excavation for the north abutment footing revealed a soft condition which was overcome by displacing the mud with gravel and bailing the muck. It was necessary to place about 40 tons of 3-in. gravel to produce a base upon which the foundation concrete could be placed.

In addition to the main cofferdan inclosing each construction area, the contractor installed around each footing a solid wall of 3-in. splined gum sheeting driven into a hard stratum about 7 ft. below the grade of the footing to stop any infiltration. At all four locations, footing concrete was placed against the splined sheeting, which was left in place.

Piledriving—With the exception of 30 piles in the south abutment, which were installed by a local outfit with a light skid rig and jet, all foundation piles were driven by the Snyder Engineering Co., of Middlesex, N. J. Even with a pressure jet, this company found the driving difficult in a creek bottom of peat and sand filled with old logs and stumps. The contractor drove the piles through this resistant material to a solid layer with a Vulcan No. 2 steam hammer hung in swinging leads on the boom of a stiffleg derrick mounted on a skid base. When driving a pile, the swinging leads were firmly guyed in four directions. Steam was provided by an old threshing-machine boiler. For jetting, a Barnes road pump supplied about 75 g.p.m. at 200-lb. pressure.

Present and Accounted For —

A Page of Personalities

❖

PERRY A. FELLOWS, acting chief engineer of the Federal Emergency Relief Administration, has been placed in charge of the Works Progress Administration's road-building program which, it is estimated, will employ 600,000 men at a cost of $800 per man-year for labor and materials. He is a former CWA regional engineer and served as city engineer of Detroit from 1925 to 1931.

ROBERT A. ALLEN *(below)* until recently state engineer for the Public Works Administration in Nevada, is now state highway engineer of Nevada.

LIEUT.-COL. BREHON SOMERVELL, Corps of Engineers, U. S. Army, has been relieved of his duties as assistant to the Chief of Engineers in Washington, D. C., and placed in charge of new engineer district with headquarters at Ocala, Fla. He will be in charge of the construction of the trans-Florida ship canal project for which the President recently approved a $5,000,000 allotment from federal relief funds. The total length of the proposed canal between Jacksonville and Inglis will be 195 mi., of which 95 mi. will be artificial waterway and the remainder enlargements of existing river channels.

FRANK F. ROGERS, former state highway commissioner of Michigan, is the most recent recipient of the George S. Bartlett Award for "outstanding contribution to highway progress." The award is made annually by a committee of one representative each from the American Association of State Highway Officials, the American Road Builders' Association and the Highway Research Board.

JAMES T. SWEENEY *(below)*, head of Sweeney Bros., road-building contractors of Scranton, Pa., is serving as president of the Associated Pennsylvania Constructors, state branch of the Associated General Contractors of America.

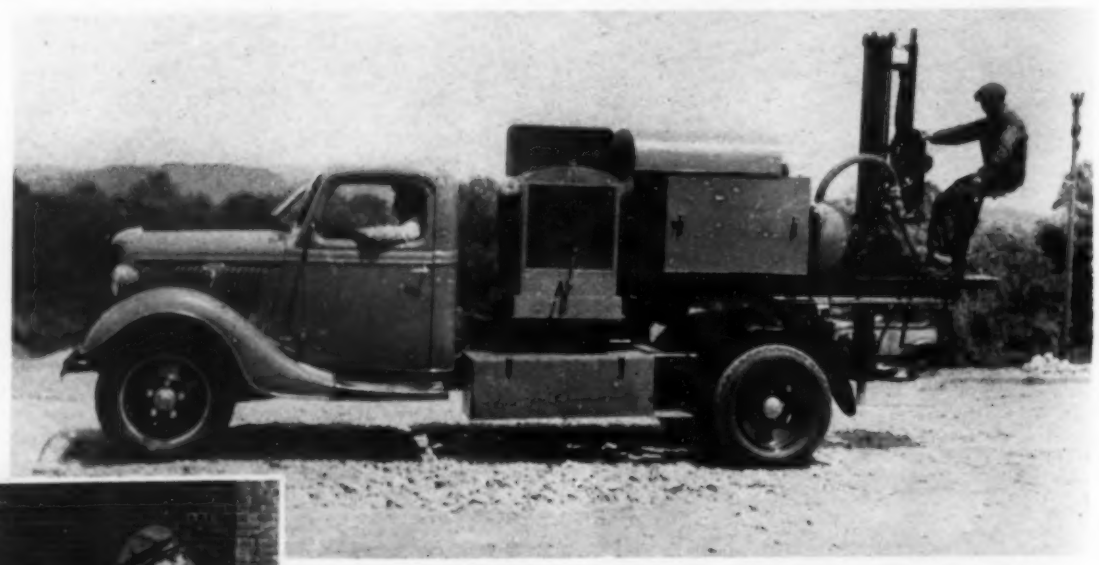
LEE HUNTLEY has been placed in charge, as construction superintendent, of building Pickwick Landing dam, latest of the three big dams (including Norris and Wheeler) to be started by the Tennessee Valley Authority. Including concrete and earth embankment sections Pickwick Landing dam will have an overall length of 7,667 ft. Mr. Huntley formerly was construction superintendent on Wheeler dam.

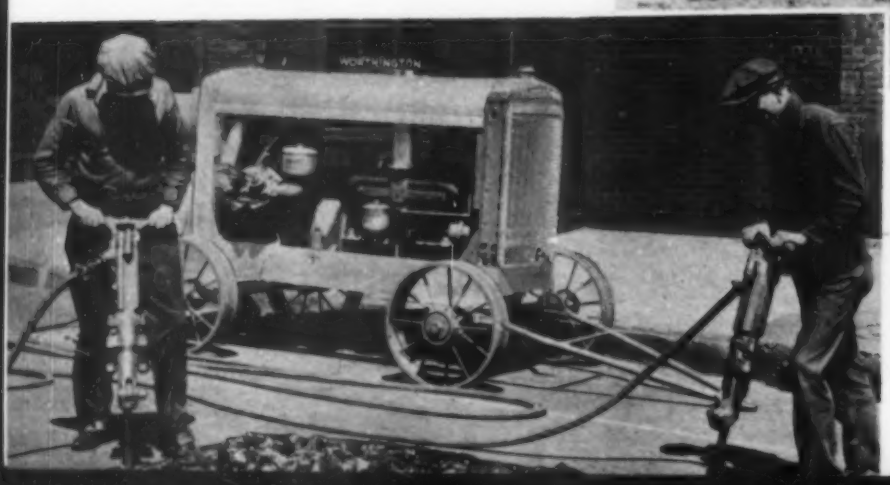
NEW EQUIPMENT ON THE JOB

CRAWLER MOUNTED CONVERTIBLE SHOVELS (two new models) are built for heavy-duty service, arranged for gasoline and diesel engine or electric motor drive, and equipped with 1¼-and 1½-cu.yd. all-manganese steel dippers. For shovel duties they are equipped with 22-ft. shovel boom and 16-ft. 6-in. dipper stick. As a dragline, machine will handle bucket on 45-to 50-ft. boom. As a crane one model has rated capacity of 21 tons at 12-ft. radius and 6,600 lb. at 45-ft. radius on 45-ft. boom; other handles capacity load of 25 tons at 12-ft. radius and 7,600 lb. at 45-ft. radius on 45-ft. boom. In trenching, standard solid bottom buckets are used, size depending upon character of work—Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill.

POWER UNIT *(left and above)*, for more efficient operation of grading machines, consists of one to four cable drums depending on equipment to be operated. Mounted at rear of tractor. Power transmitted from tractor transmission through shaft mounted on roller bearings to drums for cable winding and unwinding by means of cone clutches and alloy-steel gears. Controlled by finger-tip lever conveniently placed so that operator may observe both tool and road. Unit *(left, above)* built for loggers, consists of one small and one large drum, former operating bulldozer, angledozer or rooter, latter providing free rolling line for other uses. This unit may be used independently for highline, bunching, and skidding operations—R. G. Le Tourneau, Inc., Stockton, Calif. and Peoria, Ill.

PNEUMATIC CONCRETE BREAKER *(right)* for use of highway departments, railroad companies, utility corporations and municipalities, consists of breaker and compressor mounted on Ford V-8 truck. Air is furnished by 180-cu.ft. compressor, driven by a 30-hp. Buda motor. Finger-tip operation of self-starter, throttle lever, clutch lever, swing lever, stop and signal button. Weight 10,400 lb. Cuts width of pavement ranging from 1 in. to 5 ft. 4 in. in one operation. Breaks concrete pavement at rate of 100 sq.yd. per hour and 2-ft. trench at rate of 50 lin.ft. per hour—Concrete Cutting Corp. of America, Brooklyn, N. Y.

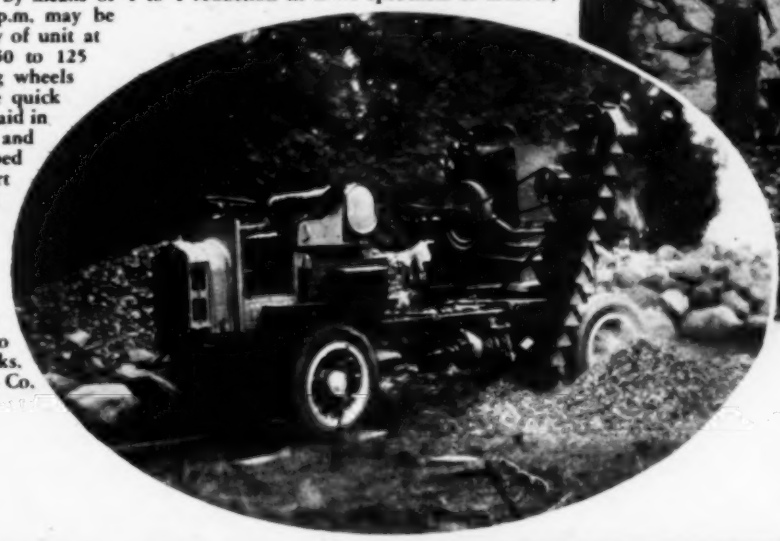




FOR GENERAL DEMOLITION *(left)*, concrete breaking, heavy tamping, ripping pavements, removing slag in blast furnace work, driving sheetpiling and allied uses, this convertible "Master" Breaker and Sheeting Driver has been designed. Hits hard, slow, slugging blow and operates without fatigue-creating recoil, enabling operator to produce more work each day. Conversion to sheeting driver is simple and quickly accomplished. If desired, either tool may be acquired as separate unit. Net weight of breaker 82 lb; length overall, without tools, 29 in. Net weight of driver, 120¼ lb; length, 28¾ in. Air consumption through ¾-in. hose is low—Worthington Pump and Machinery Corp. Harrison, N. J.

ONE-MAN MAINTENANCE MACHINE *(right)* **is made out of Caterpillar trailer patrol when it is equipped with this pole-type mounting for front-hand controls. It can be used behind any make of tractor. Position of single handwheel (which controls both ends of blade by means of shift lever) can be adjusted to position within easy reach of operator. Handwheel can be raised or lowered to desired height by changing setting of links that extend upward from pole bracket to support control box. Forward position is changed by adjusting telescoping link that extends from top of king bolt to base of control box. Tube of this telescoping link is provided with long slot and rod with numerous holes so that by changing position of pin through rod and tube, handwheel can be set at most desirable position for operator. Controls may also be swung back temporarily to prevent interference with end of tractor.—Caterpillar Tractor Co. Peoria, Ill.**

PORTABLE ROCK CRUSHER UNIT *(right)*, **for speedy transportation from job to job, consists of 3-ton FWD truck of seat-over-motor type equipped with overhead eccentric type rock crusher mounted on rear of frame and driven by truck motor. Crusher is equipped with continuous belt-type bucket feeding and loading elevators and is driven direct from main shaft of transmission. With governed speed of 1,200 r.p.m. in direct drive and by means of 4 to 1 reduction in drive sprockets of crusher, crushing speed of 300 r.p.m. may be maintained. Rated capacity of unit at this speed ranges from 50 to 125 tons per day. Four driving wheels of truck enable it to make quick trips to new locations and aid in maneuvering unit to stone and gravel supplies in cramped quarters is given by short wheel base. Photo at right shows rock crusher unit from feeding side with large capacity feeding elevator and view in oval is taken on the loading side showing how elevator may be used to advantage in loading trucks. —Four Wheel Drive Auto Co. Clintonville, W. Va.**

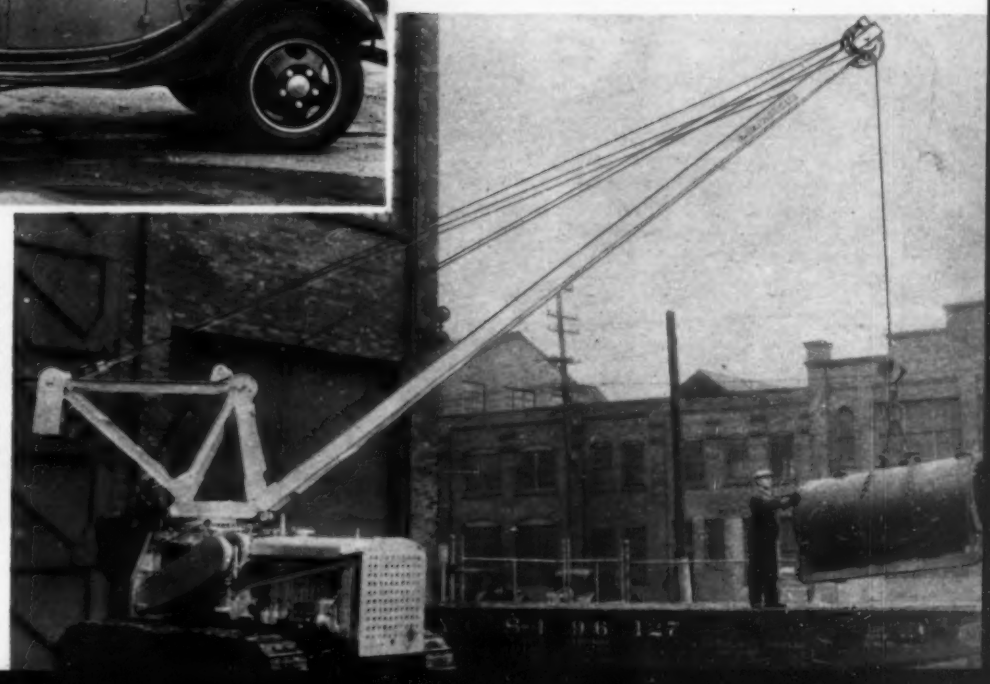


If You Want Further Information —

Within the space limits of this page it is impossible to present complete information about the products illustrated.

The manufacturers, however, will be glad to supply further details if you will write to them.

SPLIT PROPELLER . POWER TAKE-OFF *(left)* **delivers approximately full power of truck motor for operation of truck mounted compressors, pumps, portable generating plants for lighting systems and arc-welders, and thus enables one truck to handle a job usually performed by two. Unit operates from truck drive shaft by clutch controlled from driver's cab. When pull of lever engages clutch, power passes through multiple V-belts to rear axle or to machine designated to utilize it. Photo shows compressor driven by power take-off in service of Iroquois Gas Co. at Buffalo—Davey Compressor Co. Inc., Kent, Ohio.**



MOBILE CRANE *(right)*, **large size "Loadmaster," handles loads up to 7 tons which qualifies it for taking care of heavier industrial and railroad jobs such as track laying, pipe line work, and steel erection. Machine has lifting capacity of 13,900 lb. at 12-ft. radius. Boom swings through arc of 240 deg. Adaptable to practically every load and traction condition, its manufacturer claims, because of the following characteristics: (1) Low ground bearing pressure which insures safe travel over soft spots; (2) Equalized crawler mounting enables traction belt to maintain maximum contact with ground; (3) Perfect steering control. When not in use as crane, it may pinch hit in any job a tractor of equal weight would perform—Bucyrus Erie Co. South Milwaukee, Wisconsin.**

NOTHING TESTS A CRAWLER LIKE DRAGLINE SERVICE

. . . And Here's How

LORAIN 40-37-30 Center Drive Crawlers Perform

30 MILES TRAVELED IN 3 MONTHS

● This ¾-yd. L-40 of the Hughes Const. Co., Hughes, Ark., had to travel 8 miles to reach the job pictured above, through virgin, pathless forests, traveling through water knee deep most of the way. Equipped with 30" treads, this L-40 has traveled over 30 miles in 3 months under its own power, under similar, severe travel conditions, without using mats for travel or operation. Such mobility is one big reason Hughes Const. Co. has just purchased a second L-40 dragline.

100 MILES TRAVELED IN 6 MONTHS

● The ½-yd. L-30 of the South Texas Water Co., has worked 6 months, including 3 months of double shifting, on rice field irrigation. It's 15 miles from the pump house to the end of the main drainage canal, yet the L-30 made this round trip 3 different times to take care of emergency work. This 90 miles of cross-country travel under its own power, plus its many shorter moves on regular work total over 100 miles of crawler travel in 6 months.

THE UNIVERSAL CRANE CO., LORAIN, OHIO

Universal LORAIN 40-37-30

Rejuvenated by I·BEAM·LOK

Rerouting of traffic in Forest Park, St. Louis, made it necessary to refloor the Lafayette Bridge to conform to H-20 loading, so that it could be used by heavy double-deck park buses weighing 14 to 18 tons unloaded. The bridge consisted of four braced arch supporting ribs with a ¼" plate deck which was seriously corroded and buckled. Superior Structural Steel Company, contractors, selected I-Beam-Lok for the reflooring. Because of the strength and light weight of I-Beam-Lok, no change in the bridge structure was necessary to secure the increased loading capacity.

The advantages of I-Beam-Lok apply to small and large, new and old bridges. The finished floor is an armored concrete, anti-skid surface of enduring satisfaction. Progressive concrete cracks are impossible. Speedy erection is facilitated by the fact that delivery trucks and concrete mixers can be run over the unfilled units as soon as they are secured to bridge stringers. A copy of the I-Beam-Lok Booklet will gladly be sent upon request.

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Pacific Coast Representatives: COLUMBIA STEEL COMPANY, San Francisco

Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York

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United States Steel Corporation Subsidiaries

Thank you Mr. Coughlan!
You asked for results
—we made delivery

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JAMES J. COUGHLAN, FOUNDER, 1864-1931
ENGINEERS AND CONTRACTORS
2 CONGRESS STREET
HARTFORD CONN.

September 24, 1935

Moretrench Corporation
Rockaway
New Jersey

Gentlemen:

It is with great pleasure that I write you regarding your wellpoints.

Your points have done everything that you claimed on our Hartford Intercepting Sewer. Ground water was at elevation 10, and our trench bottomed at elevation 4.

Our sewer here is a 6'6" reinforced monolithic concrete structure 7,148 feet long. We have dug this whole job without sheeting our trench thanks to Moore Wellpoints.

I am enclosing a few photographs of the job.

Very truly yours,
JAMES J. COUGHLAN & SONS, Inc.
Harry J Coughlan
President

HJC:H
Enc.

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MOVE MORE DIRT *FASTER!*

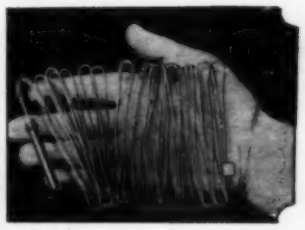
For lowest cost dirt moving, *use Continental Wagon Scrapers* the modern *scoop-up* and *carry-away* units. Made in 5 and 7 yard sizes, they cut, scoop and carry, dump into fills, windrows or stock piles, against culverts, bridges or walls. Designed for maximum operating flexibility. No labor required—they operate from the tractor driver's seat. Fast — rugged — foolproof. Continental Wagon Scrapers speed up the job and greatly lower dirt moving costs! Send today for new descriptive bulletin.

Five 7-yd. Continental Wagon Scrapers operated by William L. Lathers, Jr., at West Salem, Wisc., for cut, fill and windrow work.

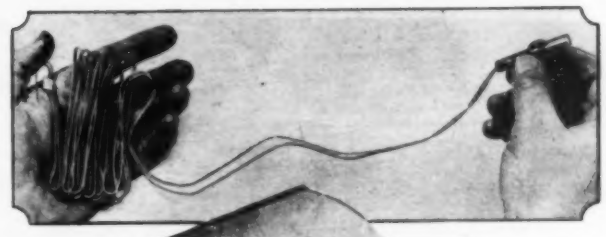
CONTINENTAL ROLL & STEEL FOUNDRY CO.
Industrial Equipment Division

332 S. Michigan Ave., Chicago, Ill.

General Offices: East Chicago, Ind.



Handy to carry. Easy to open. Wires folded accordion-wise, and supported by the tube, enclose and cushion the detonator. When tube is removed wires extend naturally into position. Permits priming without disturbing the rest of the Accordion Fold.



Accepted!

The use of Atlas Electric Blasting Caps in the Handy Accordion Fold is standard practice. Such nation-wide acceptance was readily predicted by those who first saw this new package development in 1933.

Its advantages, in safety and convenience, were so obvious that standardization was merely a matter of time. And—as has been proven—a very short time!

The acceptance of Atlas Accordion Fold Electric Blasting Caps demonstrates the fact that blasters are always receptive to new ideas of sound, practical value.

If you have overlooked this important Atlas "First" ask the Atlas Representative to show it to you. To see it is to accept it!

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Everything for Blasting

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EVERY contractor wants tools that give longer service, but lighten and speed up the work. When it comes to shovels the Genuine O. Ames fulfills these requirements.

For one hundred and sixty-one years this Plain Back Shovel has been the leader in its field. The famous Ames Bend, giving a perfect balance and a sense of lightness, is one feature that is a distinctive help in shoveling.

The time-tested special (1) Alloy Steel embodying Ames' successful attainment of the perfect compromise between hardness and flexibility, the (2) electric welded straps, the (3) selected XXX Quality highest grade second growth Northern White Ash handles and the (4) Armor-D handle grip, are reasons why Genuine O. Ames cuts the cost of both the shovels and shoveling.

Furnish your men with Genuine O. Ames, the shovel with that good "Feel", you'll find it a surprising aid to faster and better shoveling.

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IF you want to see the last word in Bucket Loaders —the machine that has Synchronized Feeding, Slow Crowding, Knee Action Oscillating Axle, Tank Type Chassis Frame, Welded Buckets, Hard Faced Bucket Lips, Quick Acting, Self-locking Swivel Spout, Floating Boom, Automatic Overload Release Sprocket, and many other features that put it jumps ahead of the field, send a card for the illustrated folder on the New Barber-Greene Model 82 Bucket Loader. There is no obligation.

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The Round Type Form Bucket with a narrower gate.

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The Round Type Foundation Bucket for mass concrete.

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Center Dump. Positively controllable. Operating handle at end of bucket so that operator stands on the forms. In sizes from ½ to 4 yds.

Insley has built thousands of buckets but has never made a better bucket than THE INSLEY ROUND TYPE.

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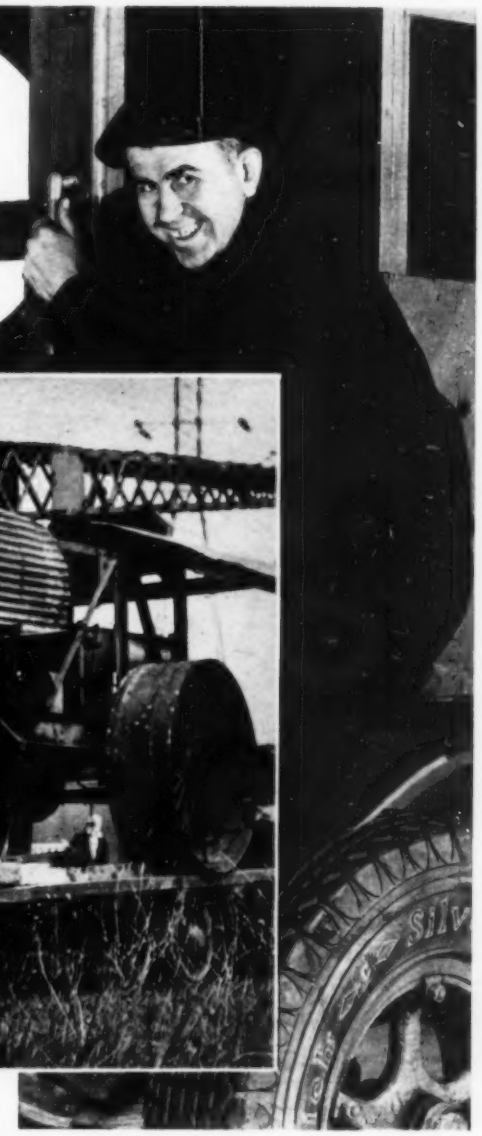
"GOODRICH TIRES NEVER LET US DOWN!"

Says **RAY BURRIS,** *Foreman*
F. Landon Cartage Co., Chicago



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You, too, should use this new kind of tire. There's nothing else like it for construction jobs! Because a revolutionary invention in the sidewall actually checks 80% of premature failures! This sidewall protection, this Triple Protection, prevents a big cause of blow-outs—cuts down delays—slashes tire bills.

If you want to set a new high for mileage, a new low for costs, get the only tire that has this 3-way protection:

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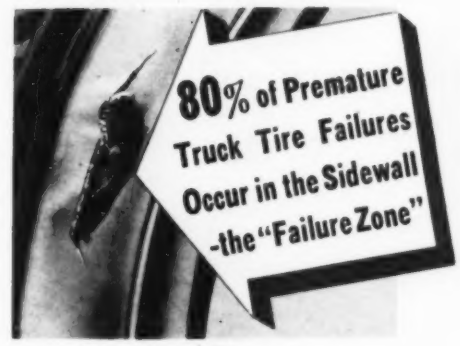
2 PLY-LOCK—the new Goodrich way of *locking* the plies about the bead. Anchoring them in place. Positive protection against the short plies tearing loose above the bead.

3 100% FULL-FLOATING CORD—Each cord is surrounded by rubber. With ordinary cross-woven fabric, when the cords touch each other, they rub—get hot—break. In Silvertowns, there are no cross cords. No friction.

Don't delay. Follow the lead of the sharp buyers. Put Triple Protected Silvertowns on every truck wheel. You pay *nothing extra* for the extra service you are bound to get.

FREE! 44-PAGE HANDBOOK FOR TRUCK OPERATORS

Every truck owner, every driver should have this big 44-page handbook. Gives commodity weights, tire load capacities, inflation schedules, dual spacing chart, load analysis and other useful information. No obligation. Write for free copy. Dept. T-108, The B. F. Goodrich Co., Akron, Ohio.



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SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

Built Stronger For Rougher Usage

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"FAVORITE" Reversible Ratchet WRENCH

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Works on a quick straight-ahead ratchet movement, and the socket form of head is not removed from the nut until operation is completed.

Can be used in narrower places than an ordinary wrench.

A TIME-SAVER

The design of the "Favorite" wrench is simplicity itself, having no complicated parts necessitating expensive machine work.

It is an efficient time-saving tool at a proper price.

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SNOW PLOWS

"A Type and Model for every purpose"

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"Oldest and largest builders of truck operated snow plows in the world."

There is no Doubt about the load on this line.

It has been definitely determined with a Martin-Decker Cable Tension Indicator. Excessive strain has been eliminated.

You can learn the load on every line on the job with one of these instruments.

Two sizes, for cables from ¼" to 2⅜" in diameter; loads up to 260,000 lb.

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This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.
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BUY PERFORMANCE AND ECONOMY

Concrete is mixed both thoroughly and rapidly in Blaw-Knox TRUKMIXERS due to a unique design of deeper mixing blades. Water measurement is reliable and accurate. Blaw-Knox TRUKMIXERS are easy to operate. Their sturdy construction, freedom from breakdowns and maintenance expense insures economical operation. ***Write for full details.***

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Large Capacity and Portability

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PORTABLE ASPHALT PLANTS

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Hot or Cold Mix

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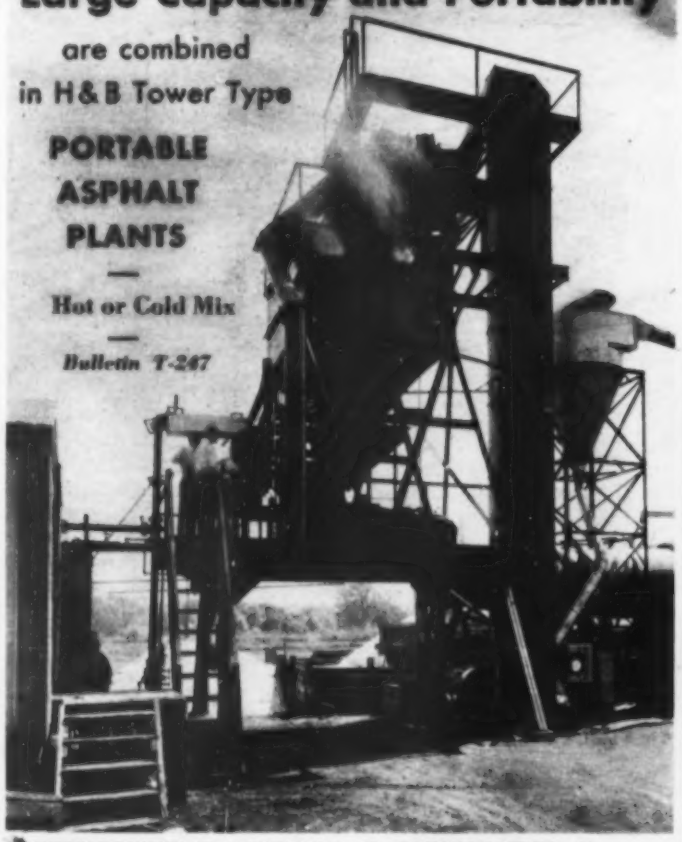

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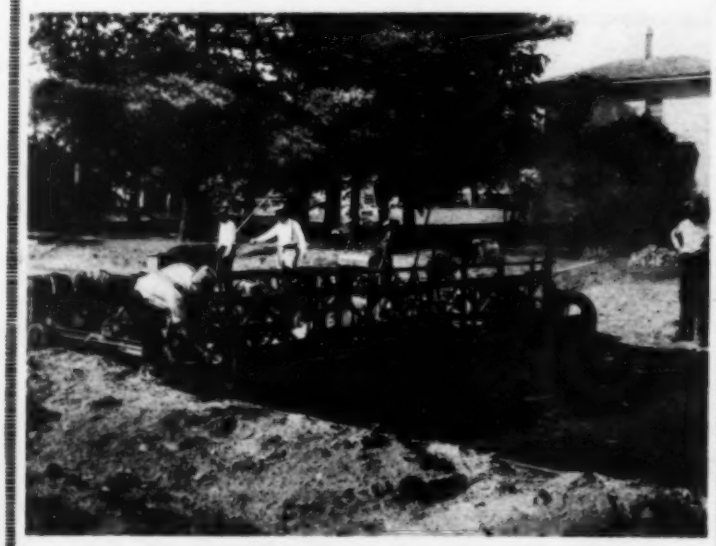

A smooth riding surface results when using the FLEX-PLANE SURFACER. The machine shown has six wheel traction. Consult us on all black top surfacing problems. Most likely we can assist you.

FLEXIBLE ROAD JOINT MACHINE CO.

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That concrete paving and building construction have taken a definite trend toward the faster, surer, easier, more economical and more efficient Calcium Chloride method of curing is attested by the constantly growing number of completed jobs in which it has been successfully used and of projected ones for which it is being specified.

YEAR-ROUND CONSTRUCTION . . . Due to Calcium Chloride's value for accelerating the hardening and curing, cold-weather concrete attains full strength and concreting is made a year-round rather than a seasonal industry.

GREATER STRENGTH CONCRETE . . . Calcium Chloride insures the development of high-strength concrete at all temperatures; and, due to its accelerated curing properties, enables earlier removal of forms and shortens the opening time for traffic by as much as one-half.

INCREASED WORKABILITY . . . With Calcium Chloride the water content can be reduced by one-half gallon per sack of cement and a workability retained equal to that of plain concrete. Result: Increased strength, greater density and durability.

CONTROLLED MOISTURE CONTENT . . . Calcium Chloride in the mix controls the moisture content of the concrete—thereby materially minimizing detrimental volume changes and hair checking.

That Calcium Chloride used integrally is the ideal, modern curing method is amply confirmed by many authoritative findings—including exhaustive research by the National Bureau of Standards. For a copy of salient extracts from this Bureau's report, "Effect of Calcium Chloride on Portland Cement and Concrete," and other free literature, write to this Association or to any of its Members.

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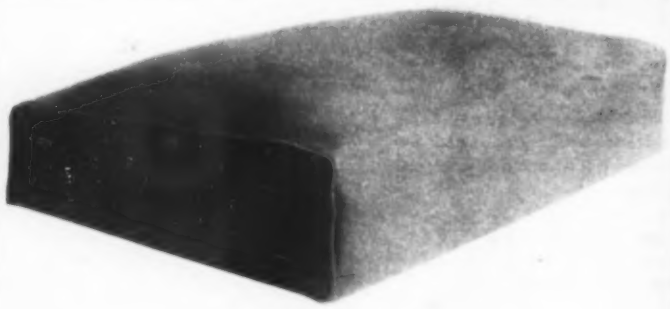
AIR COMPRESSORS

An exclusive Chrysler economy feature . . . complete automatic control which suits the speed to the load. Now—with a Chrysler—you always have "that extra man at the controls" without cost. ★ For getting the job done, and done right, Chrysler offers a portable air compressor with a host of new and exclusive features—interchangeability of parts, water cooled after-cooler, electric starting, mechanically controlled valves for high volumetric efficiency, and, above all, it has complete automatic control. ★ If you demand results investigate the Chrysler Portable Air Compressor. Write today for the new illustrated catalog.

CHRYSLER CORPORATION . . . AMPLEX DIVISION . . . DETROIT, MICHIGAN



SPONGEX

SPONGE RUBBER SEAT CUSHIONS

SADDLE OR BOX TYPE

Provide a cushion for every seat. Spongex Cushions are all sponge rubber construction. They last far longer than spring cushions and give superior riding ease and protection.

SPONGE RUBBER PRODUCTS CO.
DERBY, CONNECTICUT

SPONGE RUBBER PRODUCTS CO., Dept. M, Derby, Conn.

Please send me your booklet, "A New Way to Ride on Rubber."
I am interested in Spongex Cushions for Tractors ☐ Road Machinery ☐ Trucks ☐ .

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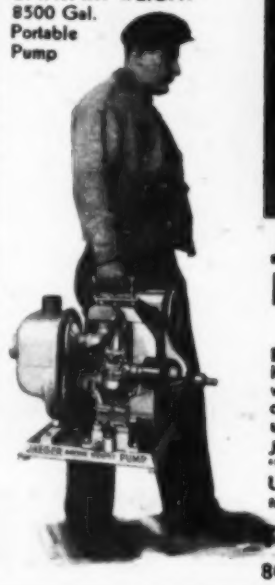
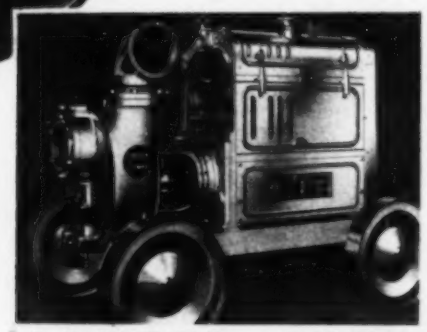
TITLE .....

Below:
"BANTAM WEIGHT"
8500 Gal.
Portable
Pump





JAEGER "SURE PRIME" PUMPS

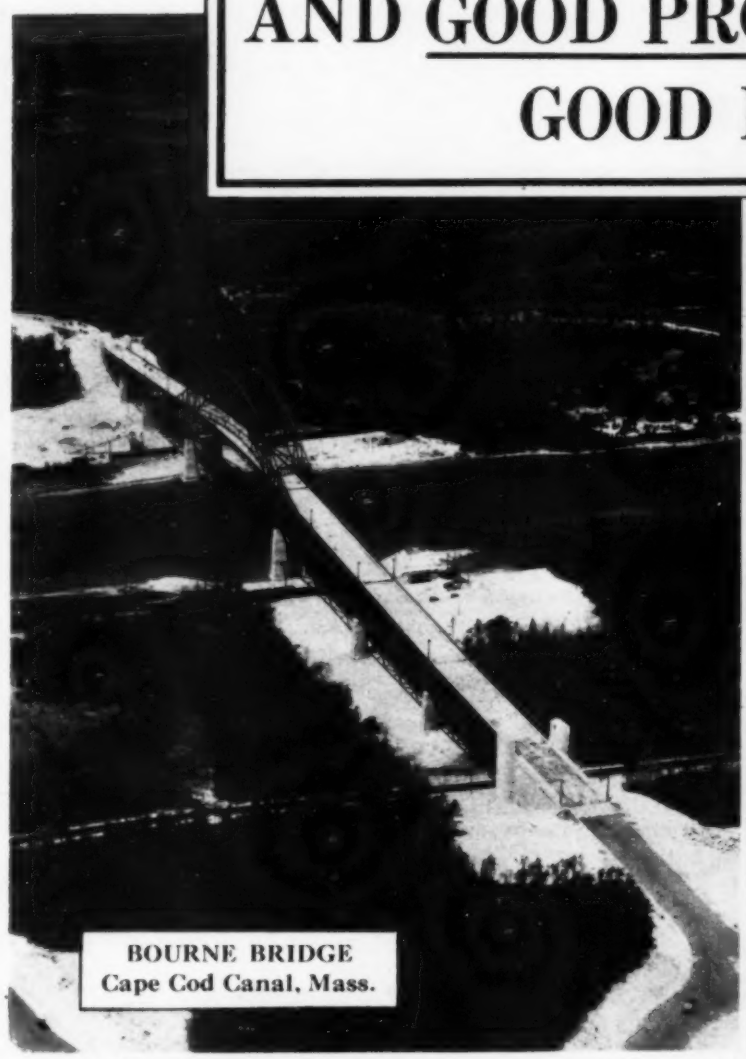
(10,000 TO 135,000 GALLONS)

Built in 2", 3", 4", 6" and 8" sizes, Jaeger Heavy Duty Self-Priming Centrifugals are world's largest selling pump of their type for construction jobs, industrial work, public utility and municipal maintenance, etc.

JAEGER WELL POINT SYSTEMS provide "dry job" conditions at lowest known cost. Used on small jobs and biggest. Send for new CATALOG P-35.

THE JAEGER MACHINE CO.
800 Dublin Ave. Columbus, Ohio

GOOD ENGINEERING AND GOOD PRODUCTS MAKE GOOD ROADS



Bridge Decks—Socony Asphalt over a mop coat of Socony Waterproofing Asphalt. *Approaches*—Bituminous Macadam using Socony Binders B & C.

Photos by 101st Photo Sect., 26th Div. Aviation, Mass., N. G.

Standard Asphalt Road Oils · Standard Asphalt Joint Fillers · Standard Waterproofing Asphalt · Standard Cut-Back Surfacing Asphalt · Standard Asphalt Binder A for surface treatment · Standard Refined Asphalt for sheet asphalt paving · Standard Cold Patch Asphalt for all types of patching · Standard Asphalt Binders B & C for penetration work (Asphalt Macadam). Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete) · Standard Asphalt Emulsion for Surface Treatment, Penetration, Road and Plant Mix, and Patching · *Specifications and all other particulars furnished on request.*

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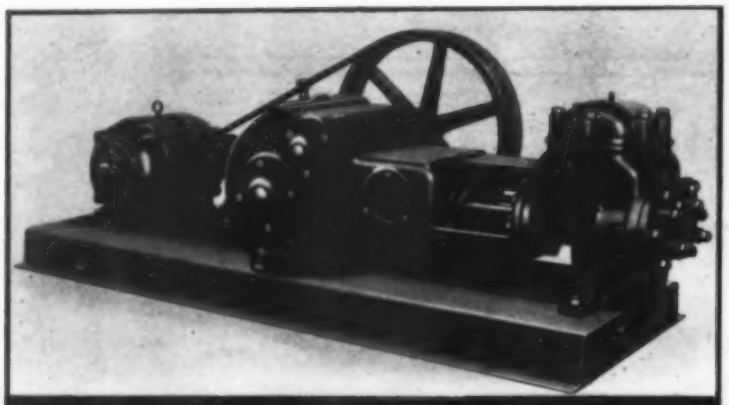
SOCONY ASPHALTS AND ROAD OILS

SOCONY-VACUUM OIL CO.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION



WATER UNDER PRESSURE

WHERE you want it, WHEN you want it with an F-M self-oiling power pump

● Out on the job, where there's water to be moved, pressure and delivery rate aren't the only things that count when there's a pump to be chosen. Its attendance requirements, its efficiency and its ability to deliver under adverse conditions make a big difference both in operating costs and performance.

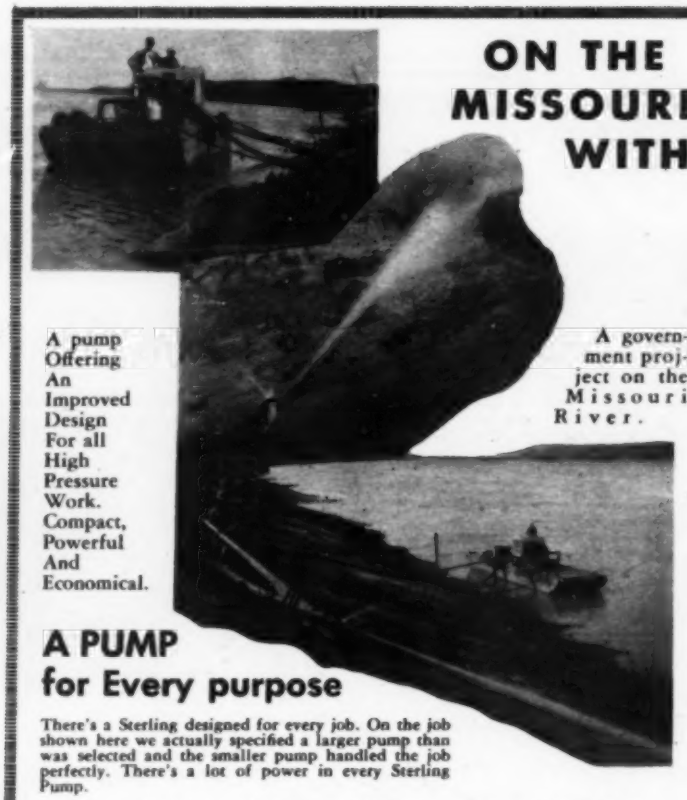
F-M self-oiling power pumps are especially built for service in remote and inaccessible locations. Sturdy and simple in design, they provide pressures up to 500 pounds per square inch, to handle a wide range of construction applications. Because they are completely self-oiling, attendance is reduced to a minimum.

The F-M power pump illustrated is driven with the efficient Flex-Mor drive. Other models are readily available with pulley for belt drive or with top-mounted electric motor connected by silent chain, self-enclosed. For service away from established power lines, they are also furnished with Fairbanks-Morse gasoline engine or Diesel drive. For complete information, address Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 32 branches at your service throughout the United States.

Pioneer Designers and Manufacturers of POWER, PUMPING AND WEIGHING EQUIPMENT *105 Years*

FAIRBANKS-MORSE PUMPS

6440—PA 31.18



ON THE MISSOURI WITH

A pump Offering An Improved Design For all High Pressure Work. Compact, Powerful And Economical.

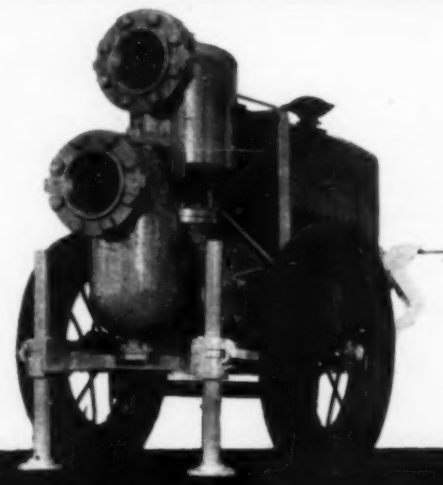
A government project on the Missouri River.

A PUMP for Every purpose

There's a Sterling designed for every job. On the job shown here we actually specified a larger pump than was selected and the smaller pump handled the job perfectly. There's a lot of power in every Sterling Pump.

If you have not received our combined pump catalog and bulletin of engineering data — send for it at once—IT'S FREE. Very valuable to everyone interested in pumping problems.

Sterling
MACHINERY CORPORATION
111-13 Southwest Blvd. Kansas City, Mo.



LABOUR PUMPS

Husky strength and maximum simplicity — only one moving part — combine to make LaBour Pumps dependable as the day is long. They're always on the job — which means fewer grey hairs in your head and more dollars in your pocket. Write for complete details.

LaBOUR

THE LABOUR COMPANY, INC.
1300 Sterling Avenue
ELKHART, IND

MILLIONS *of* HOURS *of* WORK

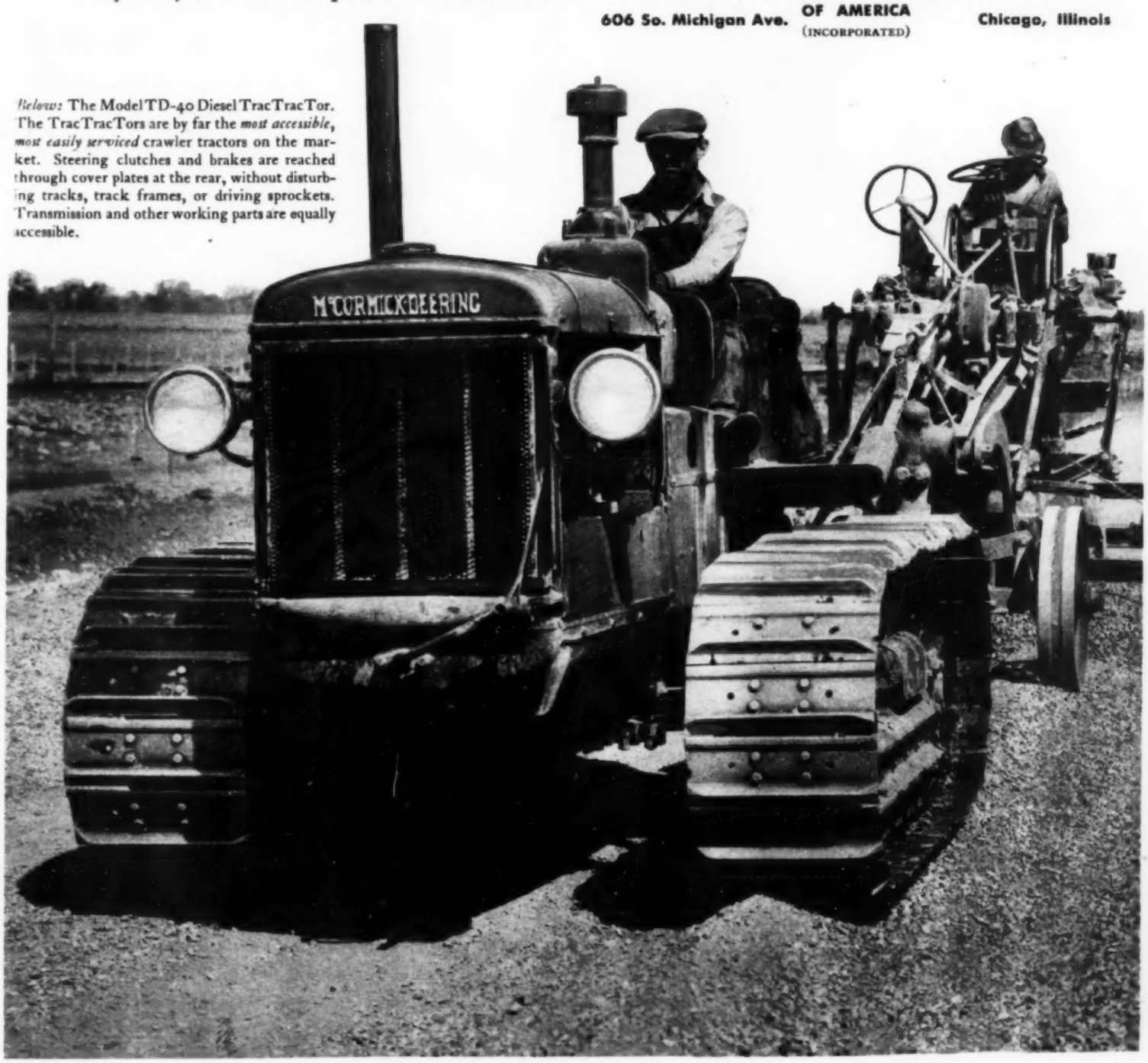
—the Practical Endorsement Back of International Harvester Power

WHEN the need for industrial power arises, bank on this wealth of experience. Let it be your guide in selecting power—be satisfied with nothing less than this proved performance which is a guarantee of what this power can do for you. Furthermore, you will be getting the benefits of low operating and maintenance costs that have appealed so strongly to users in every field.

If your jobs call for powerful crawler or wheel tractors (gasoline or Diesel); for compact, mobile small tractors to handle difficult work in cramped areas; for power with inbuilt equipment of great variety; for fixed power units (gasoline or Diesel) of lasting quality, consult the nearest International Harvester branch or industrial distributor. Write us for information.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. **OF AMERICA** (INCORPORATED) **Chicago, Illinois**

Below: The Model TD-40 Diesel TracTracTor. The TracTracTors are by far the *most accessible*, *most easily serviced* crawler tractors on the market. Steering clutches and brakes are reached through cover plates at the rear, without disturbing tracks, track frames, or driving sprockets. Transmission and other working parts are equally accessible.



Here's how to handle ROAD WIDENING Jobs TODAY!

1. Set up Jaeger Portable Transfer Loader near job and haul to it in rented batch trucks.
2. Transfer material to Jaeger Side Discharge Truck Mixers for the short haul. You can place 15 to 20 cu. yds. per hour direct in forms with two 2½ yd. mixers working on 1 to 2 mile hauls.

The Jaeger Portable Concrete Plant (Side Discharge Truck Mixers with Transfer Loader) moves with the job. As haul lengthens, you simply rent more batch trucks.

- GET HIGH PRODUCTION with small investment by keeping Truck Mixers on short haul and making more trips.
- GET FLEXIBILITY: Truck Mixers can deliver concrete at widely scattered points.
- GET BETTER CONCRETE: A proven advantage of Jaeger Truck Mixers.
- GET REAL SAVINGS: Because of big production, with small investment, direct discharge to forms, no long water lines and no traffic interference.

FOR PRICES, JOB DATA AND OTHER DETAILS, WRITE TO

THE JAEGER MACHINE COMPANY
800 Dublin Ave., Columbus, Ohio

JAEGER

WATER-PROOFING with Sika

1 Original surface hacked
2 Water concentrated to enlarged bleeder holes by Sika #4A.
3 Two bleeder holes plugged by Sika #2. Infiltrations concentrated to bleeders.
4 Inserting Sika #2 into last bleeder hole.
5 All bleeder holes plugged with Sika #2, and trimmed to contour.
6 Protective coat of Sika #1 cement plaster applied.

Use Sika to stop water inflow through any masonry. Sika mixed with portland cement easily applied by hand — seals off infiltration from underground streams even under pressure.

Write us about your problems

Sika, Inc.
1943 Grand Central Terminal
New York City

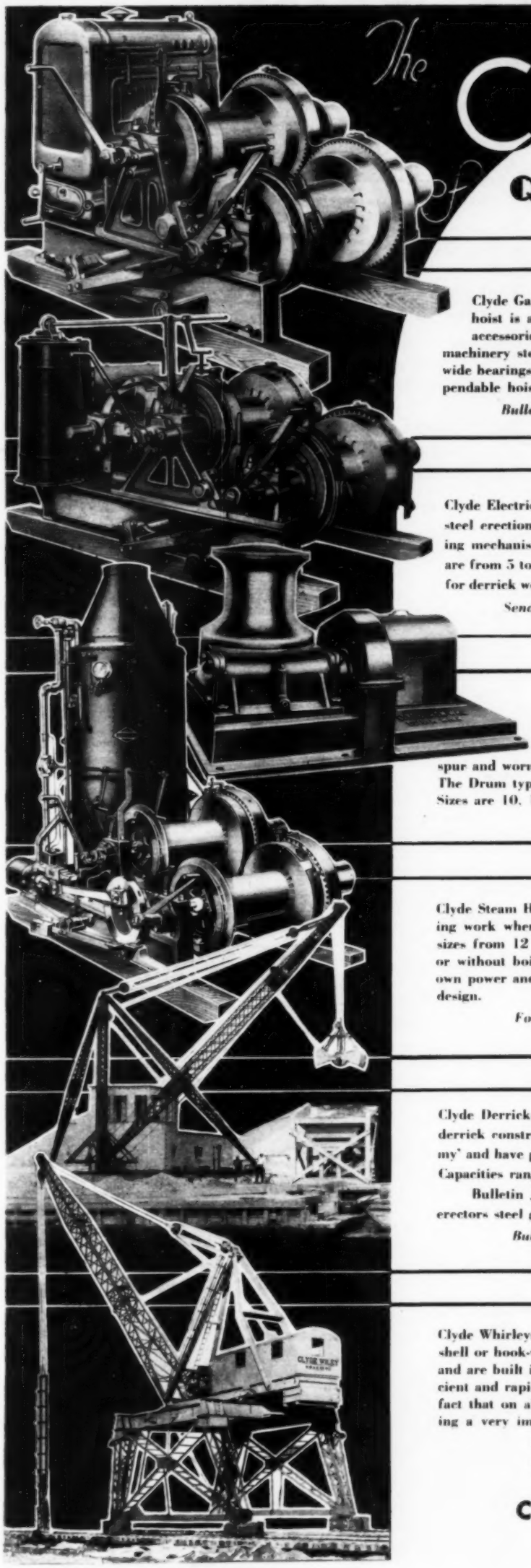
Electric

JACKSON BACKFILL TAMPER

1 h.p.

DESIGNED especially for tamping adjacent to walls, for trench work and for earth fill dams. Faster. More portable and more easily handled. Costs less to operate and maintain. Strikes more blows per minute and far more powerful blows. Does a better job. Equipped with conical or flat tamping feet and may be fitted with digging blade for breaking up asphalt, clay and similar materials. Write for circular, specifications, prices.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN



The CLYDE LINE of QUALITY EQUIPMENT

GASOLINE HOISTS

Clyde Gasoline Hoists are especially suited for all types of hoisting duty. Each hoist is a complete self-contained unit with the hoisting drums, motor and all accessories mounted on a substantial, electric arc-welded bed plate. High-grade machinery steel drum shafts, machine cut gear teeth, semi-steel side stands, extra wide bearings and large asbestos lined brake bands all provide for a trouble free, dependable hoist. A wide range of sizes from 4 to 175 horsepower.

Bulletin J4A, giving complete details, will be sent upon request.

ELECTRIC HOISTS

Clyde Electric Hoists are most generally used for concrete tower work, pile driving, steel erection, derrick work and general construction or industrial duty. The hoisting mechanism is similar in design and construction to Clyde Gasoline Hoists. Sizes are from 5 to 175 horsepower in 1, 2 and 3 drum styles. A boom swinging attachment for derrick work can be had for the 2 and 3 drum hoists.

Send for Bulletin J3A for construction details and specifications.

CARPULLERS

Clyde Electric Carpullers provide the simplest and most efficient method of spotting cars, barges or for various kinds of haulage work. Each unit is self-contained, compact and weatherproof. The Capstan Carpuller illustrated is a vertical capstan, driven through spur and worm gearing by an electric motor. Sizes are 5, 7½ and 10 horsepower. The Drum type Carpuller is a sturdy, heavy duty machine for use with wire rope. Sizes are 10, 15 and 20 horsepower.

Write for Bulletin 16 for additional information.

STEAM HOISTS

Clyde Steam Hoists are adapted for pile driving, derrick work or general contracting work where a strong, rugged machine is needed. They are built in a range of sizes from 12 to 100 horsepower, in 1, 2 or 3 drum types and may be had with or without boiler. All Clyde hoists are given a rigid test at the factory under their own power and are guaranteed against original defects in material, workmanship or design.

For additional details and specifications, send for Bulletin 12.

DERRICKS

Clyde Derricks embody a number of features which constitute a distinct advance in derrick construction. Clyde engineers have designed for 'performance' and 'economy' and have produced a line of derricks to fit the requirements of any type of work. Capacities range from one ton and up.

Bulletin J9 gives specifications and details of the steel guy and stiff-leg types, erectors steel guy derricks, steel utility derricks and steel derricks of special design.

Bulletin J8 shows the complete line of Clyde Timber Derricks.

WHIRLEYS

Clyde Whirleys are full revolving, live boom, traveling derricks, for drag-line, clam-shell or hook-work. They are equipped with either steam, gasoline or electric power and are built in sizes and capacities to meet the present day demands for more efficient and rapid material handling equipment. Proof of their superiority lies in the fact that on almost every noteworthy construction project, Clyde Whirleys are playing a very important part.

Our representative will gladly make recommendations for your own particular need, or write for Bulletin J12.

CLYDE SALES COMPANY

Duluth, Minnesota

EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of Construction Methods.

If you do not find all you need in the advertising section, we shall be glad to assist you. Write to —

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330 West 42nd St. New York City

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Socony—Vacuum Oil Co., Inc.

ASPHALT PLANTS
Blaw-Knox Company
Hetherington & Berner, Inc.

BACK FILLERS
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Harnischfeger Corp.
Northwest Engineering Co.

BARS, IRON AND STEEL
Carnegie-Illinois Steel Corp.
Inland Steel Co.

BATCHERS, ADJUSTABLE MEASURING
Blaw-Knox Company

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Firestone Tire & Rubber Co.

BELTING
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Goodall Rubber Co.
Goodrich Rubber Co., B. F.

BINS, STORAGE
Blaw-Knox Company

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Atlas Powder Co.
Ensign-Bickford Co.

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Inland Steel Co.

BOOTS, RUBBER
Goodall Rubber Co.

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Insley Mfg. Company
Link-Belt Co.
Northwest Engineering Co.

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Blaw-Knox Company

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Roeblings's Sons Co., J. A.

CABLEWAYS
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Calcium Chloride Assn.

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International Cement Corp
Universal Atlas Cement Co.

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Koehring Company

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Universal Crane Co.

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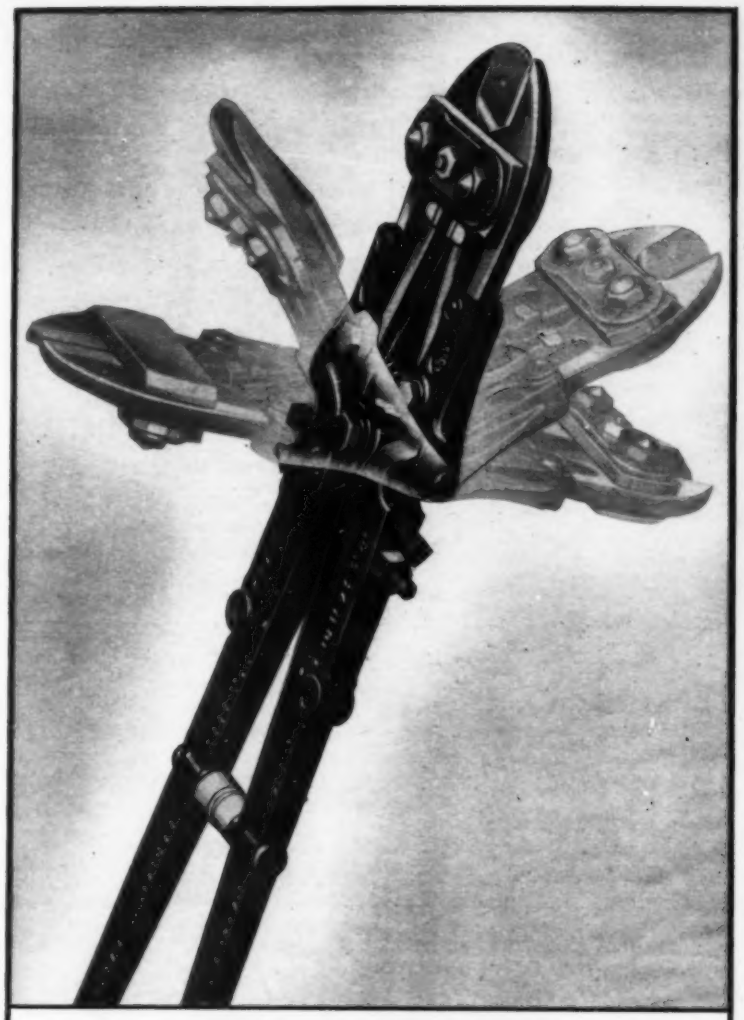
Koehring Company

(Continued on page 72)



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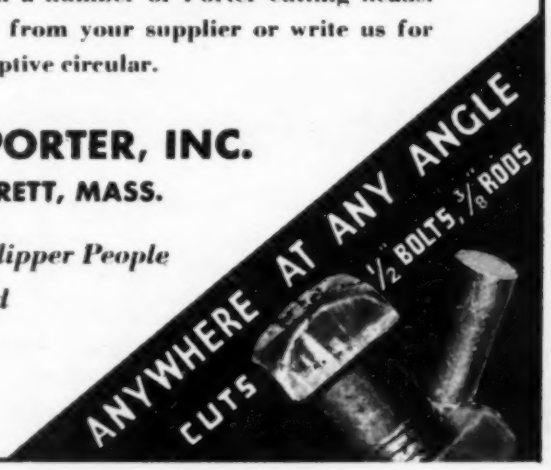
SWIVEL HEAD CUTTER

It is literally "the tool of a thousand uses." Goes places and does things that the rigid type of cutter could never attempt. The cutting head can be adjusted in any desired position as is shown in the picture above. Cuts at all angles without loss of power—without straining or bending on the part of the operator. Reaches *over*, *under* and *around* an obstruction as nimbly as an arm. The porter Swivel Head helps every mechanic to do better work, quicker. Available in a number of Porter cutting heads. Order from your supplier or write us for descriptive circular.

H. K. PORTER, INC.
EVERETT, MASS.

The Bolt Clipper People
Established
50 Years



"SUBWAY"

RED COVER AIR TOOL HOSE

To each contractor who operates air tools we want to send a sample of "SUBWAY."

After you have examined the sample you will be impressed. There is something in "SUBWAY"—in it's strength and ruggedness—that will interest you. You will want to try a few lengths on your drills, and that is the very thing we want you to do. We know that the good opinion you form from the sample will be more than justified by the hose in service.

Just fill in the coupon and send it to us. There is no charge, and no obligation.

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New York • Pittsburgh • Philadelphia • Cleveland
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GOODALL RUBBER COMPANY,
5 South 36th Street, Philadelphia, Pa.

Mail sample of "SUBWAY" Air Hose to

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Address .....

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Sika, Inc.

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Austin-Western Road Mchy. Co.
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● DELAWARE AND CAPE COD CANAL CONTRACTORS CHOOSE JOB-PROVED LE TOURNEAU EQUIPMENT

(Above) A tandem hookup of LE TOURNEAU 12-YD. CARRYALLS at work widening Cape Cod Canal.
(Right) LE TOURNEAU 12-YD. CARRYALL digging into the fine sand, originally hydraulic fill, along the Delaware Canal.

When contractors Edward H. Ellis, Inc. and Burkett Construction Company were awarded contracts for 4,000,000 cu. yds. of dry excavation on old, historic Delaware Canal, it was natural that they should take advantage of the low-cost earthmoving of LE TOURNEAU equipment. Ellis bought six 12-YD. CARRYALLS* and one 75 BULLDOZER. Burkett purchased three 12-YD. CARRYALLS*. Today these ten units are busy widening, deepening and straightening the Delaware Canal.

When Merritt, Chapman, Scott Corp. won the contract to widen the present Cape Cod Canal, Ed Eichacker, pioneer eastern user of LE TOURNEAU equipment, subcontracted 150,000 cu. yds. Today his tandem hookup of two 12-YD. CARRYALL* SCRAPERS, an 8-YD. CARRYALL* and a BULLDOZER are working on this job.

Thus, LE TOURNEAU equipment rolls on to two more major earthmoving projects and assures profits to three more contractors. Ask your tractor dealer for data sheet proof telling what LE TOURNEAU equipment is doing on earthmoving jobs the country over.

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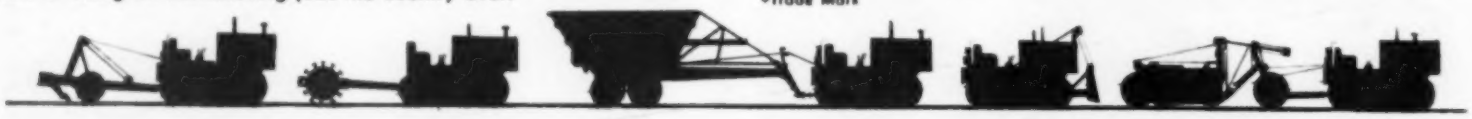

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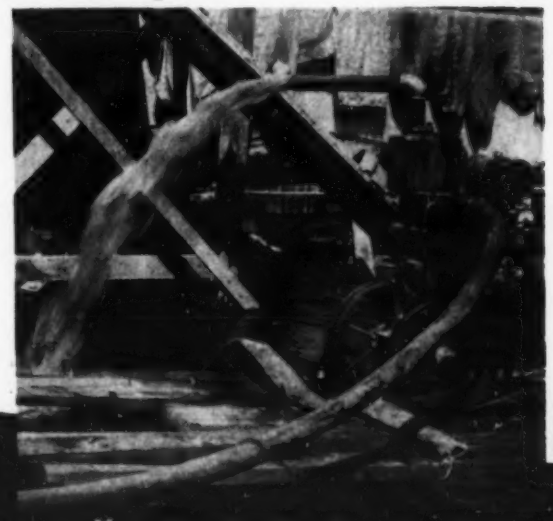

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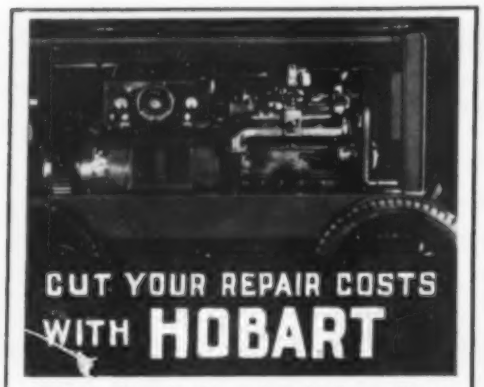

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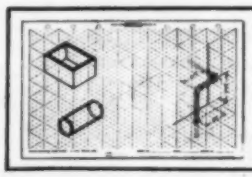

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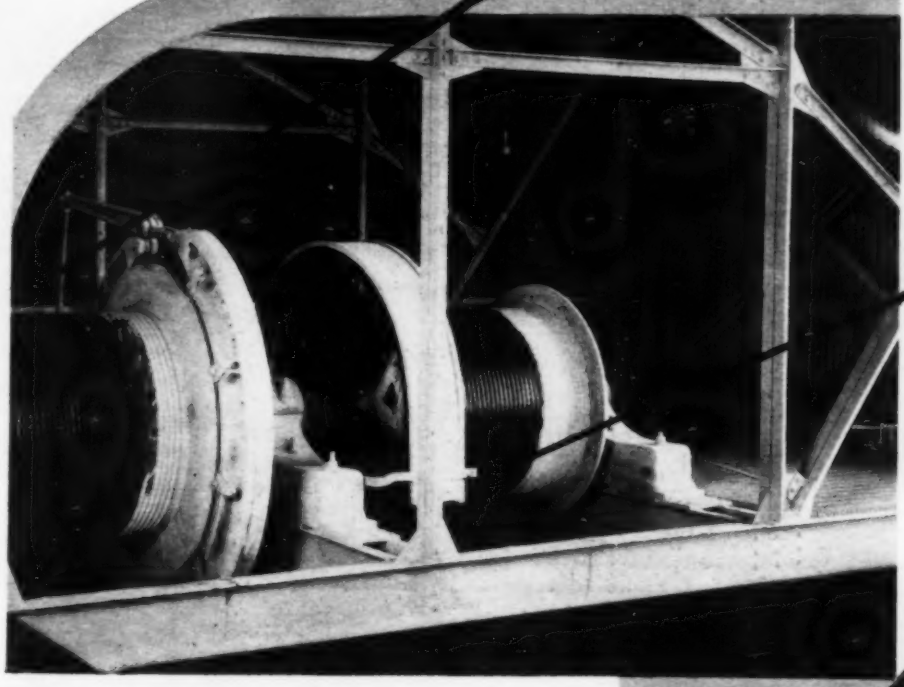

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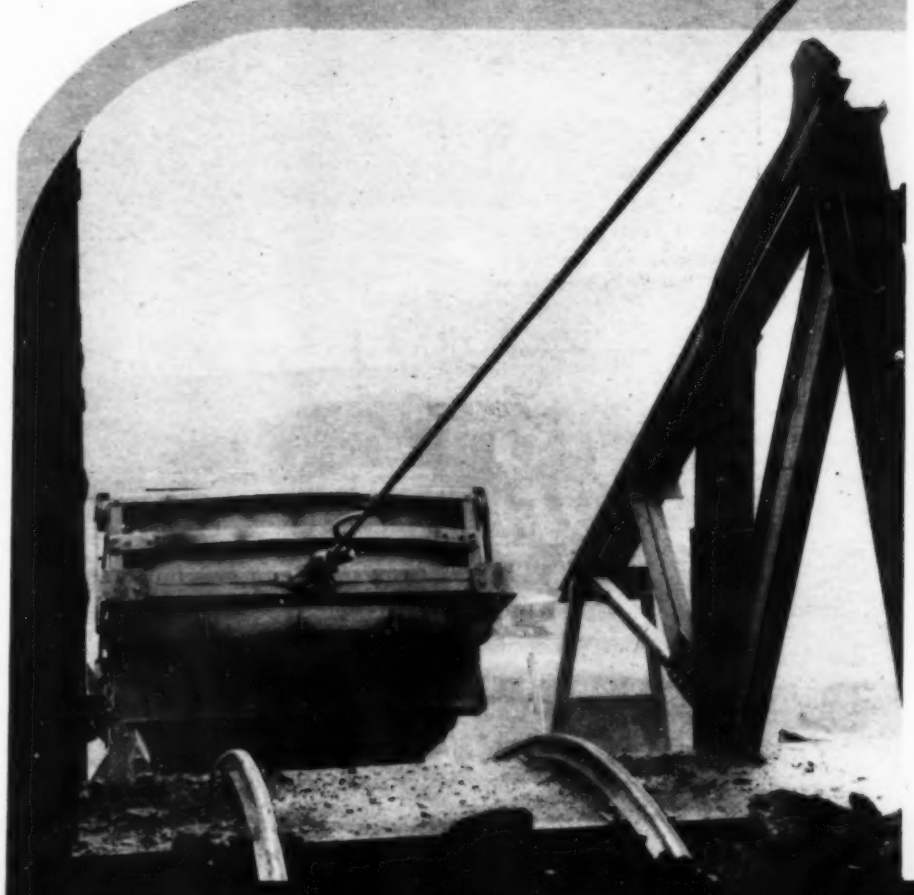

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